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A
TREATISE
ON
MINERAL WATERS.

IN TWO VOLUMES.

By DONALD MONRO, M. D.

PHYSICIAN TO HIS MAJESTY's ARMY AND
TO St. GEORGE's HOSPITAL, F. R. S.

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ERRATA CORRIGENDA.

Page 4, line penultima of note, for 1761, read 1661. P. 6, l. 6, for *at its full* read *at their full*. P. 14, l. 2 and 3, of note, dele *Mr. Cavendiſh*, and for *have* read *has*.

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PART II.

OF

WARM MINERAL WATERS.

HAVING taken a general view of ſome of the moſt remarkable cold mineral waters, we come next to conſider thoſe which have acquired a greater degree of heat, in the body of the earth, than common ſpring water; and which raiſe Fahrenheit's thermometer to above 60 degrees as they riſe from their ſprings.

It has long been a queſtion among philoſophers, what is the cauſe of heat in theſe waters? and many have been the ſolutions of this problem; but the two opinions now moſt generally ſupported are, that it is either occaſioned by—1. Subterraneous fire.—2. Or by the mixture of certain mineral bodies, with water, in the bowels of the earth.

1. The heat of waters in the neighbourhood of volcanoes, ſuch as thoſe of *Ætna*, *Ve-*

ſuvius, *Hecla*, &c. is certainly owing to ſubterraneous fire[a], and the number of ſuch waters

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[a] That we may have ſome idea of the frequency of theſe ſubterraneous fires, I ſhall in this note mention from Monſ. *Colonne's Hiſtoire naturelle de l'Univerſe, Tom.* 1. *part* 2. *chap.* iv. a number of places in the different quarters of the world where they have been obſerved.

EUROPE. The moſt remarkable in Europe are thoſe of *Ætna* in Sicily, *Veſuvius* in the kingdom of Naples, *Hecla* in Iceland, beſides ſeveral others of leſſer note, ſuch as thoſe in the iſland of *Lipari* ſituated in the Tyrrhenian Sea, north of Sicily; ſome in Italy in the country of *Modena*, and near to *Bologna*.—The ſtream of fire that is near to *Grenoble*, in the province of Dauphiny in France, which often burns above a little brook, which has from thence been called the burning fountain.—The volcanoes in the iſlands of *Thermia* and *Santorin*, and other iſlands in the Archipelago Sea.—And in *Lapland* and other places which have not as yet been particularly deſcribed.

ASIA. In the countries of *Chaldea* and *Aſſyria* are ſeveral burning mountains; and on the high road between Keleck and Bagdad one meets with nothing but ſprings and pools of hot waters.—And in Media, at a place called the *White Tour of Suſa*, the fire iſſues out of the earth by fifteen different apertures.

The iſland of *Ormus* is almoſt totally deſtroyed by ſubterraneous fire.

At *Mount Copſantee* in Bactria is a famous volcano; on *Mount Taurus* one ſees frequent fires; and in the *northern parts of Tartary* the Muſcovites ſay there are ſeveral mountains which vomit fire.

In *China* there are many places where there are ſubterraneous waters muſt be very great, as volcanoes and appearances of ſubterraneous fire ſeem to be

raneous fires; and Father Martini ſays, they are very frequent in the province of Kiang-ſy—and that near the town of Kiang-ſy there is the burning mountain of *Coaſang*, which warms ſeveral baths and medicinal waters.

They are not only frequent on the continent of Aſia, but likewiſe in the iſlands to the ſouth of it; for in the iſland of Bourbon, or Maſcarin, is the burning mountain of *Alamagan*, which has deſtroyed part of the country—another in the iſland of *Sumatra* near Bantam—and one in the iſland of *Java*, near the town of Panaracam, which ſometimes throws out flames and ſtones near to the town—and ſeveral in the Molucca and Phillippine iſlands, and in the iſland of *Japan*, and the iſlands near it.——And Dampier mentions his having ſeen ſeveral in *New Guinea*, *New Holland*, *New Britain*, and other parts of the ſouthern continent.

Africa. In Africa there are likewiſe many.—There are ſeveral in the kingdom of *Congo*——Four in *Angola.*——*Mount Janiguald* in the kingdom of Fez——and mount *Eſperien* in Æthiopia——Four in Guinea, and ſeveral others which have been obſerved in ſailing along the coaſt.——And there is one or two in the Cape de Verd iſlands.

America. In South America, in the range of mountains which go through *Chyli* and *Peru* and *Mexico*, which the Spaniards call the *Cordeilleras*, there are fifteen volcanoes on the tops of high hills; and a vaſt number of warm waters every where through the country; and ſome of the rivers in the neighbourhood of the great volcano in Mexico are ſo hot, that they are not fordable; and there are volcanoes in Guardaloupe and ſome others of the American iſlands.

very frequent in many places of the globe.

2. But it is moſt probable that the heat of waters found in other countries, where there are no volcanoes, or any ſuſpicion of ſubterraneous fire, is occaſioned by the mixture or ſolution of certain mineral bodies in the body of the earth; and particularly by water running over veins of the pyrites ſtone, as Dr. *Liſter*, Dr. *Hoffman*, and others have alledged.

From the certain accounts given by *Berger*, and other authors, of the pyrites ſtone heating in mines, and from its being ſo common in every country, moſt late authors on mineral waters have embraced this opinion.

We have two remarkable facts related by authors, which, if true, prove beyond a doubt, that ſome waters are heated in this way.

Henricus de Rocchas, in the firſt chapter of his tract on mineral waters[b] tells, that in order to diſcover the cauſe of the heat of the water of a certain fountain, near the mountain called Pleiniſſelus, in a deſert place of Savoy in Italy, from which the river Po takes its riſe, he made the earth be dug, and at the end of fifteen days the workmen came to a place where the water was very hot and boiled; but after digging three days longer, they found the waters which neceſſarily ſupplied the hot ſpring, to be perfectly cold. —And Dr. *Short*[c], in his account of the tepid baths at Matlock in Derbyſhire, ſays, that all the warm waters ſpring up from between fifteen and thirty yards above the level of the river Derwent; for that either higher or lower the ſprings are cold; ſo that the materials warming and impregnating theſe waters lie in that height.—He tells likewiſe, that in digging to diſcover the nature of the minerals through which the waters paſſed, the workmen came to a mixture of a white and black croil ſtone, encompaſſed with and cloſely adhering to the limeſtone, at which place the waters began to be tepid; that after this, on coming to a great ſtore of black croil, ſpar, limeſtone, and ore, with ſome little cauk, and by and by to a ſtrong thick bed of black croil ſet about with ſpar, and mixed with ore in the bowels, of limeſtone, the waters roſe up with an impetuous force, and at its full warmth; on digging deeper the heat of the waters decreaſed, for he ſays there the waters are warmeſt where the black croil is thickeſt, in the black or blue limeſtone.—The Doctor carried home with him ſpecimens of the different mineral ſubſtances which were dug up; and on infuſing them ſeparately in common water found, that none of them generated heat; but that on mixing the two infuſions of the croil ſtone, and of the limeſtone, the ſpirits of a thermometer, which was ſet in the veſſel into which they were poured, immediately roſe five degrees.

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[b] This treatiſe of *Henricus de Rocchas* is to be found in the 6th volume of the *Theatrum Chymicum*, page 716. publiſhed at Straſburgh, (Argentor. 1761.)——It is there ſaid to have been firſt publiſhed in French in the year 1634.

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[c] In his 1ſt quarto volume p. 72, &c.

Warm waters, both plain and impregnated with mineral ſubſtances, poſſeſs a great many of the virtues and properties of cold waters of the ſame claſs, and impregnated in the ſame manner; but are preferable in many caſes, being more kindly and agreeable to the ſtomachs of weak people, and when taken up into the blood more effectually dilute it, and ſoften and relax the veſſels, and promote a free perſpiration by the ſkin; and when externally applied, they more effectually ſoften and relax every fibre.

Hence it is that warm mineral waters, both drank and uſed as baths, and their ſteams or vapours received on the body, are more effectual in the cure of many diſeaſes than cold waters;—and hence it is that the drinking warm liquors, joined to the uſe of warm baths and fomentations, is often ſo effectual in the cure of diſeaſes from rigidity, and of ſpaſms and convulſions, that theſe remedies ſo often remove rheumatic and other pains, and inflammations and tenſion of particular parts; and that they often procure paſſage through the bowels in caſes of obſtinate coſtiveneſs; and prove a cure in retentions of urine, and in variety of other caſes which had reſiſted the force of other remedies.

And hence it is that the drinking and bathing in many warm mineral waters, has been found ſo effectual in the cure of cutaneous diſeaſes.

As the natural warm mineral waters have been found to be ſuch uſeful remedies in the cure of diſeaſes, it is certainly neceſſary for practitioners to be well acquainted with their particular natures, virtues, and properties; and therefore I ſhall endeavour to give a diſtinct and ſhort account of ſome of the hot and warm waters which have been moſt particularly deſcribed by authors, and which may be moſt uſeful to practitioners in this part of the world; and ſhall firſt conſider thoſe which have been more accurately examined, ranged under the four following heads, in the ſame order as the cold waters were.

I. Thoſe impregnated with *acid*, *alkaline*, or *neutral ſalts.*

II. Thoſe which contain a *foſſil oil*, or *ſulphur.*

III. Thoſe impregnated with ſome *metallic matter.*

IV. Thoſe which have an *earth*, either diſſolved or ſuſpended in them.

And then take notice of ſome few which have no particular taſte or ſmell, nor more of any mineral body diſſolved in them than common waters; and likewiſe ſome few which have been mentioned, but not particularly deſcribed by authors.

Before entering into the account of any of theſe claſſes of waters, it is neceſſary to obſerve,

1ſt. That the waters of hot ſprings have been much uſed as *Baths*, both by the antients and moderns; and therefore moſt of them are called by that name.

2dly. That as the fall of theſe warm waters, on particular parts, hath been found to cure local diſorders, pumps and other contrivances have been made uſe of to raiſe the water, that it might fall with force on the diſeaſed parts; and ſuch falls have been called by modern latin authors *Balnea ad Ducciam*, and *ad Stillicidia*, and by the Engliſh *Pumps*, and falls of water.

3dly. That for the ſame reaſons, different means have been uſed to confine the vapour or ſteam of hot waters, ſo that it may be applied either to the whole body, or to particular parts; and the places where ſuch vapours have been confined, have been called

Vapour-Baths, and by modern latin authors *Stuphæ*.

4thly. That a mud or ſediment, impregnated with mineral ſubſtances, is often found in the bottom of the baths or reſervoirs of ſuch warm waters, which have been found to aſſiſt in removing pains and aches, and paralytic and other complaints, from parts put into it, or by being rubbed on ſuch parts;—and when this mud or ſediment is collected in any quantity in any reſervoir or baſon, it has been called *Balneum-Luti*, or a *Mud-Bath*.

5thly. That in the neighbourhood of waters heated by volcanoes, the earth is commonly hot for a conſiderable way round; and the inhabitants dig, pits or caverns, in places of a proper heat, which ſerve as ſudatories for patients who labour under dropſies, rheumatiſms, palſies, and other diſeaſes which require ſweating.—Somctimes the pits are made only ſufficient for receiving the lower extremities, and ſometimes the trunk of the body likewiſe. The patients are placed in theſe pits, and the whole body, except the head, is covered with warm ſand or earth, and they remain there till they have ſweated profuſely. At other times they make large vaults or caverns, with air-holes, which are uſed as bagnios, the natural heat being ſufficient to ſweat thoſe who ſit in them.

OF

WARM SALINE WATERS.

CLASS I.

CHAP. I.

OF WARM ACID WATERS.

IT has been already obſerved, that although many waters were formerly called acid, yet that ſince chymiſtry has been much cultivated, and accurate experiments been made, that the ſalts in moſt of them had been found to be in a neutral ſtate, the acid being ſaturated either with ſome alcaline earthy or ſome metallic matter; however, as both Mr. *Varenius* and *Colonne* make mention of acid waters being found in the neighbourhood of mount *Ætna* in Sicily, and Dr. *Vandellius*, of others being obſerved at Latera and Selvena, in Italy, it does not ſeem improbable, but that others of the like kind may be found near to volcanoes, or places where there are ſubterraneous fires, which decompoſe large quantities of ſulphur, and let looſe its acid; and ſome hot waters, as well as ſome of the cold acidulæ, have given ſlight marks of a ſuperabundant volatile acid, as they ſpring immediately from their ſources. Thus Meſſ. *Dedier* and *Regis* [a], and *Monſ. Vieuſſens* [b], in their accounts of the hot water at *Balaruc*, in the province of Languedoc, all affirm, that when it was mixed with the blue tincture of the marſh-mallow flowers, juſt after being up taken from the fountain, it ſtruck a red colour, which it did not after it had ſtood till it was cold.—And Dr. *Fantonus* [c] tells us, that the waters of the fountains or wells called *Victoria* and *Margarita*, in the province of Aoſta, in the country of Piedmont, ſtruck a red with heliotropium, when they were taken up freſh from their fountains, but did not ſo after they were tranſported to ſome diſtance.

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[a] See the *Memoires de l'Academ. des Sciences à Paris*, for 1699.

[b] See the *Acts of Trevoux for the year* 1709.

[c] See *Jo. Fantoni Comment. de quibuſdam aquis medicatis, & Diſſert. de febrib. miliariis, edit. Auguſtæ Taurinorum*, 1747.

CHAP. II.

OF WARM WATERS IMPREGNATED WITH THE FOSSIL ALKALI.

THE waters now to be conſidered are thoſe which are principally impregnated with a native alkaline ſalt, which is found mixed with the ſediment left after evaporation; it is for the moſt part ſaturated with an acid in the waters as they riſe from their ſprings; but the acid being volatile, and the waters hot, it ſoon evaporates, if let ſtand in the open air, or if the waters be evaporated over a fire[d].

What ſhews that the alkali in theſe waters is ſaturated with an acid in their natural ſtate is, that moſt of them curdle with ſolutions of ſoap, if mixed with them immediately as taken up from the fountain; however, as we obſerved in treating of cold waters of this claſs, it is not impoſſible but that hot waters, impregnated with a pure foſſil alkaline ſalt without any acid, may hereafter be diſcovered.

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[d] If what is called the *Mineral Spirit* in waters proves to be only fixed air, without the addition of an acid, as Mr. *Cavendiſh* and Mr. *Lane* have alledged, then perhaps many of the waters, now treated of, contain no acid in their natural ſtate, but only acquire their vinous taſte, and other properties, which were thought to depend on a volatile acid, from their being replete with this ſpirit as they riſe from their ſprings.

Moſt of the waters of this claſs, when evaporated, yield, beſides the native alkali, ſome portion of a calcarious Glauber or ſea ſalt, or ſome earthy matter.

They have been drank for the ſame purpoſes as the cold waters of the ſame claſs.—They act as powerful diuretics, and have been eſteemed efficacious deobſtruents, and correctors of acidity, and much preſcribed in caſes of chronic obſtructions, and in diſorders where an acid was thought to be prevalent.

Some of them, which contain a large proportion of this ſalt, act as purgatives if drank in large quantity.

When uſed in baths, they not only ſoften and relax the fibres, but clean the ſkin and carry off all unctuous and greaſy matter, more powerfully than moſt other waters.

Thoſe we ſhall conſider under this head are,

FRENCH.

BOURBON L'ARCHAMBAULT.
NERIS.
MONT D'OR.
CHAUDES AIGUES.
EVAUX.
DE SAIL LES CHATAUX MORANT.
VIC LE COMTE.
VIC EN CARLADOIS.
DE JAUDE.
DES MARTRES DE VEYRE.

GERMAN.

EMBS.

FRENCH WATERS.

BOURBON L'ARCHAMBAULT

in the Bourbonnois.

Mr. *Burlet*, who gives an account of theſe waters[a], ſays, there are three ſprings of the ſame kind contiguous to each other; that the water of all is clear and limpid, without any ſmell, and has a lixivial taſte, and after it has ſtood in the baths, it throws up a fine unctuous ſcum, but ſo thin, that it cannot be collected in quantity ſufficient to make any experiment with.

This water is ſo hot, that one cannot hold their hands in it, for any time, without pain.—It raiſed the fluid in the thermometer to fifty-four lines, which ſtood in the open air at twenty-four. The thermometer was nine and a half inches long excluſive of the ball.

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[a] Memoirs of the Academy of Sciences at *Paris* 1708. edit. 8vo. p. 145.

Although this water hath ſuch a degree of heat, yet if ſet on the fire, he ſays, it does not boil ſooner than cold common water; but when taken immediately from the fountain, it retains its heat much longer than water warmed to the ſame degree, for when the common water is quite cold, it ſtill remains tepid. This fact is confirmed by Mr. *Du Fay*, in the *Memoirs for* 1724, and by others.

Mr. *Burlet* tells us, that this water does not change the colour of tournſol, but gives a ſlight greeniſh colour to ſyrup of violets, and reſtores the colour of blue paper that has been tinged red with the acid of vitriol.

It makes an efferveſcence with all acids, but more obſcurely than the water of *Vichi.*

Galls make little or no change of colour.

Twelve pounds of this water, ſet over a fire to evaporate, at firſt emitted a ſmell, like to that of muſt of wine.—As the water evaporated, the remainder became more ſaltiſh, and there adhered to the ſides of the veſſel a whitiſh earth, that was quite inſipid.

When there remained in the veſſel only about eight or ten ounces of liquor, he filtred it, and had remaining in the paper a drachm and fifteen grains of a thick fat mucilaginous matter.

The filtred liquor was then evaporated till it threw up a pellicle, and ſet by to cool, when it afforded ſix grains of a fine chryſtalized lixivial ſalt; and the remaining liquor being evaporated to dryneſs, yielded three drachms and two ſcruples of a ſalt of the foſſil alkaline kind.

Monſ. *De Clos*, who likewiſe evaporated this water, got in the proportion of a hundred and ninety-four grains of ſediment or one three hundred and ſixteenth part of the whole from a gallon, which is only ſix grains leſs than what Mr. *Burlet* had; of this, he ſays, above nineteen grains were a white earth, which ſhewed no ſigns of any fatneſs, and diſſolved partly in diſtilled vinegar; and the remaining one hundred and ſeventy-five grains were a pure lixivial ſalt, or native alkali.

He ſays he could diſcover nothing bitumenous in the waters.

Mr. *Geoffroy*, in the *Memoirs of the academy for* 1700, mentions, that although this water is clear without any other, but a little ſaltiſh taſte, yet that the borders of the well were of a yellow colour, and had a ſlight ſmell of ſulphur, and that there was a black mud in the bottom of the well, which ſmelt badly ——that the water reddens a little the juice of the tournſol—and that ſalt of tartar occaſions a ſlight coagulum.——In the *Memoirs for* 1702, he takes notice of his having evaporated this water, and having obtained of ſediment in the proportion of a hundred and nine grains from a gallon, the ſalt of which was acrid and lixivial.

Mr. *Du Fay*, in the *Memoirs for* 1724, alledges, that the waters gave a yellow colour to a ſilver cup, into which they were put, as taken up immediately from the fountain; that the mud at the bottom ſmelt ſomewhat ſulphureous, and when dried, contained ſome particles which were attracted by the loadſtone.

Mr. *Burlet*, in the *Memoirs for* 1707, mentions, that Mr. *Seignette* had alledged that the ſaline matter was not a pure natron, but compoſed of equal parts of ſea ſalt and a native alkali, with a ſmall portion of a calcareous Glauber ſalt; but he ſays, he could find no other ſalt than a native alkali; tho' he owns that Mr. *Geoffroy* had found a ſmall portion of ſea ſalt, after long ſearching for it.

Mr. *Boulduc*, in the *Memoirs for* 1729, affirms, that he had attained rather a greater proportion of ſea ſalt than Mr. *Seignette* had mentioned, and he ſays, that the earth in the reſiduum is partly ſelenite.

From all theſe facts and experiments we ſee, —that this water contains a native alkaline ſalt, or natron, mixed with a ſmall proportion of earth (one tenth or one eleventh) which is partly abſorbent and partly ſelenitical, and probably a portion of ſea ſalt.—That altho' from Mr. *Burlet*'s experiments one ſhould imagine that it contains no acid, yet from what Mr. *Geoffroy* tells us, of its reddening a little the juice of the tournſol, and of ſalt of tartar cauſing a coagulum, one would be rather inclined to believe that it does contain an acid, which is in a very volatile ſtate and ſoon evaporates.

What Mr. *Geoffroy* and Mr. *Du Fay* ſay of the mud, and Mr. *Du Fay* of the water colouring ſilver, gives reaſon to ſuſpect ſomewhat of a ſlight ſulphureous or bitumenous impregnation; and the loadſtone's attracting ſome particles in the mud, leaves it doubtful whether there is not a very ſmall pittance of iron in the water.

This water is ſtrongly diuretic, and acts but little by ſtool, unleſs drank in large quantity; and therefore Mr. *Burlet* ſays, it is common to mix it with ſel de Seignette, when it is intended it ſhould purge.

It is drank for variety of diſorders, and is much uſed for bathing in.

NERIS in the BOURBONNOIS.

Mr. *De Clos* ſays, that this water was limpid, and quite inſipid, when brought to Paris. He mentions it as a hot water, but does not aſcertain the degree of heat.

It yielded but a very ſmall quantity of ſolid matter by evaporation; one ſix thouſand two hundred and ſeventy-two part of the whole, or near ten grains from a gallon. This ſediment, he ſays, was compoſed of a ſalt mixed with a ſmall quantity of earth, and the chryſtals of this ſalt reſembled thoſe of depurated nitre, but did not fulminate on the red-hot coals; and it precipitated, in form of a yellow powder, ſublimate mercury diſſolved in common water. From theſe experiments he concludes it to be a nitrous ſalt, or natron, approaching to the nature of borax; but I think they rather give reaſon to ſuſpect it to be a ſpecies of the calcareous Glauber ſalt.

Monſ. *De Chomel*, who likewiſed analyzed theſe waters, alledges in the *Memoirs for* 1708, that he got eight grains of ſediment from a pound of the water, which conſiſted of about one tenth of earth, and the reſt a ſalt of the nature of that got from the Bourbon waters.

MONT D'OR.

Theſe waters are ſituated at the bottom of Mont D'Or, ſeven leagues from Clermont, in the Auvergne, and are the moſt frequented of any in that country. It is not known when they were firſt diſcovered, but they are of great antiquity.

Monſ. *Le Monier*, in the *Memoirs of the French Academy of Sciences for* 1744, ſays, there were formerly three baths, but at preſent there are only two.—1ſt. Cæſar's bath. —2d. And the great bath;—the third, called the horſe bath, having been demoliſhed about the year 1714.

The heat of Cæſar's bath raiſed Reaumeur's thermometer to thirty-ſix and a half, which is equal to a hundred and fourteen and one eighth of Fahrenheit's.

The heat of the great bath raiſed the thermometer only to thirty-five, or to a hundred and ten and three fourths of Fahrenheit's.

At firſt theſe waters are ſharp and pungent, and ſtrike the noſe like new beer freſh drawn, but this is ſoon ſucceeded with a flat lixivial taſte and ſmell.—They are clear, ſit light on the ſtomach, and are ſoft to the touch like ſoap water, and they throw up more air bubbles than common water, heated to the ſame degree[a].

Though

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[a] *Monſ. de Chomel* in *the Memoirs of* 1702, ſays, that theſe waters as taken up from the fountain are unctuous, and a little

Though the taſte at firſt would make one ſuſpect a looſe acid, yet he ſays they give no proofs of it; they did not redden the blue paper, tournſol, ſyrup of violets, nor made the leaſt ebullition with oleum tartari per deliquium; but on the contrary made a conſiderable ebullition with acids, and threw up a number of air bubbles, as an alkaline ſalt would have occaſioned; and with ſyrup of violets, diluted with water, ſtruck a fine green; with alum they precipitated a white light earth, and with galls gave a brown colour.

With a ſolution of ſaccharum ſaturni, and a ſolution of ſilver in ſpirit of nitre, they became white like milk, and dropt a conſiderable precipitate.—And when concentrated, and mixed with a ſolution of corroſive ſublimate, they yielded a precipitate of the colour of bricks.

Lime water made them turbid and white. By boiling they loſt their tranſparency and their acid taſte; which they did alſo, by being kept a very ſhort time; and therefore

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little ſaltiſh, but become inſipid when cold; that they ſmell of ſulphur, or bitumen, and contain a lixivial urinous ſalt.

he thinks if they contain an acid, it is in ſmall quantity and extremely volatile.

Upon evaporating they threw up an inſipid flower, or pellicle, which was brilliant in ſome places, difficult to be diſſolved in common water, and felt like ſand in the teeth; it broke and fell to the bottom, and upon examination proved to be ſelenite; when the pellicle taſted ſaltiſh he ſeparated the precipitate and pellicle, and went on with the evaporation in hopes of getting a Glauber and ſea ſalt in chryſtals, but could obtain neither in a regular form; a thick oily bitumenous matter preventing thoſe ſalts from granulating; he therefore ſtopt the further evaporation, and had remaining a ley (Eau Mere) extremely bitter and bitumenous.

Some of the firſt reſiduum thrown on the fire lay ſtill, and produced no viſible effect; but ſome of the ſecond in part crackled and flew, and in part ſwelled up.

Oil of vitriol, dropt on a parcel of the firſt reſiduum, made a ſlight ebullition; and gave a ſmell of ſpirit of ſea ſalt, but raiſed no fumes, nor ſeemed to have much effect in diſſolving or otherwiſe altering it.—But the ſame acid, on being dropt on a parcel of the ſecond, excited a ſtrong ebullition, and afforded fumes of ſpirit of ſea ſalt; and on being diſſolved, filtred, and chryſtallized, afforded a Glauber ſalt.

Another parcel of the ſecond reſiduum, being diſſolved in diſtilled water, evaporated, and ſet to chryſtallize, yielded chryſtals of ſea ſalt, mixed with ſome longiſh chryſtals, which he ſuſpected to be a Glauber ſalt, and a foſſil alkali or natron.

Spirit of wine poured on the ley (or Eau Mere) acquired a beautiful orange colour.

From theſe experiments he concludes, that the waters of *Mont D'Or* contain a ſelenite, a foſſil alkali, and ſea ſalt, a ſmall portion of Glauber ſalt, and an oily or bitumenous matter; and he ſays, they contain nearly the ſame principles as thoſe of Bourbon l'Archambault; with this difference, that the Bourbon contain more ſelenite and ſea ſalt, theſe here more foſſil alkali and bitumenous matters.

Du Clos, who evaporated theſe waters at Paris, ſays, that they yielded one two hundred and eighty-fourth part of ſediment, which is in the proportion of two hundred and ſeventeen grains from a gallon; that it conſiſted of a white foliated matter, of which one ninth, or a little above twenty-four grains, was earth,—and the other eight ninths, or one hundred and ninety-three grains, were natron or a foſſil alkaline ſalt.

Dr. *Le Monier* ſays, that bathing in theſe waters ſweats profuſely without weakening the ſick,—that taken internally they act as diuretics; that they purge ſometimes, tho' this happens but ſeldom.

They have been recommended in the rheumatiſm, the ſciatic, the gout, the palſy, and many other diſorders. He adds, that they have been uſed likewiſe for diſeaſes of the breaſt, but he thinks that in ſuch caſes the milk diet and exerciſe contribute more to the cure than the waters.

CHAUDES AIGUES,

Situated in the high country of the AUVERGNE.

Du Clos ranks them among the hot waters, and ſays, that when they were brought to Paris, they were limpid and inſipid; but were putrefied and had contracted a very bad ſmell.——Evaporated they yielded one thouſand one hundred and thirty-ninth part of ſediment, which is in the proportion of 54 grains from the gallon; it ſeemed mixed with a mucilaginous matter like the Sperma Ranarum.

This ſediment was made up of an alkaline ſalt and an earth.—The earth was not changed by the force of fire, but diſſolved partly in wine vinegar.—The ſalt fuſed on the fire, and roſe in bliſters like borax.

M. *Du Chomel*, in the *Memoirs of the French Academy for* 1708, ſays, he evaporated theſe waters, and had eight grains of ſediment from one pound, which he alledges to have been a volatile alkaline ſalt mixed with ſulphur; but from what was formerly ſaid of the volatile alkali, being no mineral ſalt, it is probable that he has committed ſome miſtake.

I have not hitherto met with a ſufficient accurate account to be able to form a right judgment of theſe waters. We want a more particular deſcription of them, as they appear at the fountain, and a more juſt analyſis than has hitherto been given.

EVAUX OR ESVAHON,

in COMBRAILLE in the AUVERGNE.

Du Clos mentions two ſprings; the ſmall one of which yielded by evaporation one ſixteen hundred and eighth part of ſediment, which is in the proportion of above thirty-eight grains from the gallon; it had a white foliated appearance, and the ſalt was of the ſame ſort as that of Neris.

SAIL LES CHATEAU MORAND.

This water, *Du Clos* ſays, is grateful to the drinkers, and has no taſte, and is hot at the fountain.

After being brought to Paris, it yielded by evaporation but a ſmall quantity of ſediment, which appeared duſkiſh, white, and foliated, and it had a lixivial taſte. The ſmall quantity of ſalt in it ſeemed to be a natron; fuſed in a crucible it contracted a blue colour, as ſalt of tartar does when kept long in fuſion.

This water ought to be more particularly examined.

Tepid Acidulous FRENCH WATERS, containing NITRE or NATRON.

Du Clos, in his obſervations on mineral waters, Claſs iv. takes notice of ſome which he ſays are tepid at the fountain, and have an acidulous or vinous taſte, and contain a portion of the true nitre, by which he means the nitre of the antients, or natron, as we learn from his general obſervations on the ſalts of mineral waters. Theſe are,

VIC LE COMTE EN AUVERGNE.

This water is tepid, and when brought to Paris was limpid, and had an acidulous or vinous taſte, but impreſſed no ſenſe of roughneſs on the tongue. The acidulous or vinous taſte of theſe waters, and of the waters which ſtrike a colour with galls and other aſtringents, ſeems to ariſe from the ſame cauſe.——When diſtilled the acid all evaporates, and the water, which comes over into the receiver, differs not from common diſtilled water; and what remains in the ſtill or retort acquires a ſaltiſh taſte.

This water, in evaporating, threw up a pellicle, which fell to the bottom; and after the water was all evaporated, there remained one hundred and ninety-one part of ſediment, which is the proportion between three hundred and twenty-one and three hundred and twenty-two grains, from a gallon; of this two-thirds, or two hundred and fourteen grains, were a true nitre or a natron, which did not ſwell when fuſed in a crucible, but acquired a duſkiſh white colour. ——The other one-third was a white earth, which became reddiſh in the crucible, and partly diſſolved when digeſted with vinegar.

Monſ. *De Chomel*, in the *Hiſt. of the Mem. de l'Acad. des Sciences for* 1713, ſays, he only got between thirty-four and thirty-five grains from one pound of the water; and he alledges that the natron has a mixture of ſal ammoniac.

VIC EN CARLADOIS,

Is a tepid water, which, when brought to Paris, *Du Clos* ſays, was limpid and acidulous.

In evaporating it threw up a pellicle, and left a whitiſh mucilaginous ſediment, which had a ſaltiſh taſte, and weighed one nine hundred and twentieth part of the whole, which is in the proportion of near ſixty-ſeven grains to the gallon,---one half of this was a nitre or natron, the other an earth which partly diſſolved in vinegar.

JAUDE EN AUVERGNE.

There are three fountains here.—1. The *ſmall fountain*.—2. That in the *field of the poor*,—and the 3d. that of *Beaurepaire*, which all yield waters of the ſame kind.

At the fountain they are tepid, and when brought to Paris were limpid, and had a vinous ſubacid taſte; and impreſſed ſomewhat of a roughneſs on the tongue.

When the veſſels were emptied in which they were brought to Paris, there was found at the bottom a ſediment of the colour of fallen leaves.

While they were evaporating, they threw up no pellicle, nor did any flocculi appear ſwimming in the water, and they left one five hundred and fifty-third part of ſediment,

diment, which is little above a hundred and eleven grains to the gallon. It was partly made up of a duſkiſh white nitrous, or natrous ſalt, which contracted a reddiſh colour on being fuſed in a crucible; and partly of an earth, which diſſolved totally in wine vinegar.

Monſ. *De Chomel*, in the *Mem. de l'Acad. for* 1713. (Hiſt. p. 39. 8vo. edit.) ſuſpects that the ſalt is not a pure natron; but that it contains ſomewhat of a volatile ſulphureous principle.

DES MARTRES DE VEYRE EN AUVERGNE.

This water is tepid at the fountain, and when brought to Paris was extremely limpid, and had a ſubacid vinous taſte, and impreſſed a roughneſs on the tongue.

In evaporating, there formed ſeveral fine thin white pellicles, which precipitated, and adhered to the ſides of the veſſel.—The ſediment left, weighed one hundred and eighty ſecond part of the whole, which is in the proportion of between three hundred and thirty-ſeven, and three hundred and thirty-eight grains from the gallon. It was white, and had a ſaline taſte: one half of it was a nitre or natron, which when fuſed in a crucible contracted a blueiſh colour.—The other half was an earth, which changed very little of its colour, when put into a very ſtrong fire; but contracted a ſaltiſh taſte; and both before and after being expoſed to the fire, it diſſolved almoſt totally in vinegar.

GERMAN WATERS.

EMBSBAD.

The Embs hot waters, ſituated in the diſtrict of Wetteraw, in the country of Heſſe, are mentioned by Dr. *Hoffman*, who ſays, that a medical pound of theſe waters yielded by evaporation a drachm of a ſalt which formed a ſal Glauber with oil of vitriol.

Theſe waters throw up a large quantity of air bubbles; they make a gentle efferveſcence with acids, turn thick and milky with oil of tartar, green with ſyrup of violets, and duſky with galls.

From their turning milky with oil of tartar, may we not ſuſpect that they contain an earth ſuſpended by means of an acid? and from their becoming duſkiſh with galls, is there not ſome ſuſpicion of a ſlight chalybeate impregnation ?

They ought to be more particularly examined.

CHAP. III.

OF WARM WATERS WHICH CONTAIN SEA SALT.

IN the former part of this work I took took notice of the marks which diſtinguiſh waters that contain ſea ſalt, and likewiſe mentioned ſome of their general virtues and properties; and therefore I ſhall do no more at preſent than conſider a few hot waters which have been found to be impregnated with this ſalt; which are,

FRENCH.

BALARUC.
BOURBONNE EN CHAMPAGNE.
BOURBOLE.
DIGNE.
BAGNIERS.
BARBAZON.
BOURBON LANCY.
EVEAUX.
D'ENCAUSSE.

ITALIAN.

MOUNT CATINUM.
AQUARIUM.
TRESCURIA.

BALARUC, ſituated in LANGUEDOC.

Du Clos, in his account of theſe hot waters, ſays, that after they were brought to Paris they were limpid, and had an ungrateful ſaltiſh taſte; that during their evaporation a pellicle formed a top, and that they yielded one hundred and twenty eighth part of ſediment, which is in the proportion of four hundred and eighty grains, or an ounce from the gallon; he tells us, that this ſediment was ſea ſalt, without any mixture of earth that could be ſeparated by ſolution, or filtration; but as he takes notice of its having condenſed the diſſolved liquor of ſalt of tartar, there is reaſon, I think, from thence to ſuſpect a mixture of a bittern or calcareous Glauber ſalt.

Meſſ. *Regis* and *Dedier*, who examined theſe waters at the fountain, tells us in the *Memoirs de l'Academ. des Sciences*, 1699, that they emit a ſmoak, which has ſomewhat of a ſulphureous ſmell; that at firſt touching they ſeem to be of a boiling heat, tho' they immediately after feel temperate, and may be drank with ſafety; not being near ſo hot as one at firſt imagines, for they had no more effect upon eggs, which lay three quarters of an hour in them, than if they had been in cold water, nor did they even ſoften the leaves of ſorrel, which had been kept in them for ſome time.

That they are limpid, and taſte ſaltiſh, ſomewhat like ſea ſalt, but milder; and that mixed with the blue tincture of marſh-mallow flowers, as taken up from the fountain, they ſtruck a pale red, which they did not do when cold.

That evaporated they yielded a ſalt, which ſtruck a green with the tincture of violets, efferveſced with acids, but remained quiet with alkalies; and hence they conclude that it was a natron or native alkali, and not ſea ſalt.

Dr. *Vieſſens* in the *Acts of Trevoux for* 1709, gives an account of an analyſis he made of theſe waters, in which he confirms what Meſſ. *Regis* and *Dedier* had mentioned of their giving a red colour to the tincture of the marſh-mallow flowers.—He tells us, that he evaporated three pounds and four ounces of the water, and had remaining two drachms of a rough porous whitiſh ſalt, which turned to a greyiſh aſh colour as ſoon as it was expoſed to the open air; and by being kept in a phial it contracted ſomewhat of a reddiſh caſt. It had an acrid taſte, and withal ſomewhat of an acidity.——It neither fermented with acids nor with alkalies,—and mixed with the tincture of the mallow flowers, it at firſt turned green; but by ſtanding became gradually red, till it acquired the colour of red frontiniac wine.—In diſtilling this water, what came over into the receiver did not differ from common diſtilled water;——the ſalt left in the bottom of the alembic went into more irregular ſquares than ſea ſalt, and an ounce of it put into a reverberatory furnace yielded a drachm and thirty-ſix grains of an acid ſpirit; from theſe experiments he ſeems to think, that the ſalt of theſe waters is made up of a volatile acid and an alkali, and that the neutral is not a ſea ſalt, but a ſalt of a peculiar nature.

From theſe accounts of authors I think it remains doubtful what the nature of the ſalt of this water is, whether ſea ſalt, or natron, or one of them mixed with a ſpecies of the calcareous Glauber, or whether there is not a mixture of perhaps all the three;

we need more accurate experiments to determine this queſtion with certainty.

Theſe waters of Balaruc are gently purgative, and have been uſed in many of the diſorders for which ſalt purging waters are preſcribed; and as they are hot, they have been found to be particularly uſeful in caſes where warm baths are proper, to aſſiſt the operation of ſuch waters; and hence they have been found particularly uſeful in palſies and rheumatiſms, in the ſcrophula, and many other diſorders.

BOURBONNE EN CHAMPAGNE.

Du Clos ſays, it is a hot water. Brought to Paris it had ſomething of a ſaltiſh taſte, and on being evaporated left one hundred and forty ſecond part of ſediment, or four hundred and thirty-two grains and above a half from the gallon, which was a ſea ſalt without any mixture; and its ſolution mixed clear with oleum tartari per deliquium.

He obſerved nothing bitumenous in the water, tho' there is ſomewhat of a bitumen mixed with the mud in the bottom of the bath.

BOURBOLE in the pariſh of MURATS DE QUAIRS.

Du Clos reckons this among the hot waters; he ſays, it is limpid and manifeſtly ſalt. In evaporating, little white flakes were obſerved floating through the water, which ſunk gradually to the bottom of the veſſel.—The reſiduum is about one hundred and ſeventieth part of the whole, which is in the proportion of three hundred and ſixty-two grains from the gallon,—one twentieth part of this was a brown whitiſh earth, which partly diſſolved in diſtilled vinegar, but ſuffered no change in the fire; the reſt was ſea ſalt like to that of Bourbon Lancy.

DIGNE EN PROVENCE.

Du Clos ſays, it is a hot limpid water, that has a ſaltiſh, but not ungrateful taſte. It yielded by evaporation one two hundred and ſeventieth part of ſediment, or two hundred and twenty-ſeven grains from the gallon. The ſalt he calls ſea ſalt, but from its cauſing a coagulum with oleum tartari per deliquium, one has reaſon to ſuſpect that there is a mixture of a bittern, or calcareous Glauber ſalt with it.

BAGNIERS in the BIGORRE.

This place has long been famous for its baths. *Du Clos* mentions ſix ſprings that are in repute.—1ſt. The little bath.—2d. The Queen's fountain.—3d. The bath of St. Roche.—4th. The great bath.——5th. The fountain of la Forgue.——6th. The fountain of ſalvation (de ſalut.)

1ſt. The waters of the little bath are reckoned to have the third degree of heat. When brought to Paris they were limpid and inſipid. During their evaporation they threw up a white thick pellicle, and there remained of ſediment one four hundred and eighty-eight part of the whole, which is above one hundred and twenty-five grains from the gallon; of this one third or forty-two grains were a marine ſalt; the reſt an earth, that was neither diſſolved by acids, nor changed its conſiſtence or colour by the force of fire.

2d. The water of the *Queen's fountain* is of an equal heat with the laſt.——At Paris it was limpid, and had no taſte;——by evaporation it yielded one four hundred and fortieth part of ſediment, or above one hundred and thirty-nine grains from the gallon, of the ſame ſort of ſediment as the little bath; excepting that one fourth only was ſalt.

3d. The fountain of *St. Roche* is of equal heat with the other two.——At Paris it was very limpid and inſipid; while evaporating it threw up leſs of a pellicle, and yielded one three hundred and thirty-fourth part of ſediment, of the ſame kind as the other two, which is very near one hundred and eighty-four grains to the gallon; of this one fifth was ſalt, the reſt earth.

4th. The *great bath* is the hotteſt, and is only uſed for bathing in. At Paris it was very limpid and inſipid; evaporated it yielded one ſeven hundred and a ſixteenth part of ſediment, or eighty-five grains from the gallon; of this one fourth was ſalt.

5th. *La Forgue* at its ſpring is reckoned to have the firſt degree of heat. At Paris it was limpid and inſipid; evaporated it yielded one four hundred and nineteenth part of ſediment, or one hundred and forty-ſix grains and a half from the gallon; of this one fourth was ſalt.

6th. The fountain of ſalvation (de ſalut) is of the ſame kind, but yielded only one ſixteen hundredth part of ſediment, or thirty-eight grains from the gallon.

Monſ. *De Secondat* gives the following account of theſe waters in a *Memoire* which he read in the *Academy of Bourdeaux in the year* 1745; in which he mentions ſeveral ſprings which are not taken notice of by Monſ. *De Clos*.

The waters of the fountain *du Salut* bring along with them a number of parallelopipedon pyrites, which are found in the bottom of the baths.

When they are evaporated with a gentle heat, there firſt appears on the ſurface a number of ſmall cryſtals that unite and form a pellicle that is inſipid; but afterwards, when the evaporation is near finiſhed, thoſe which form on the ſurface have a ſalt pungent taſte, and therefore ſhould ſeem to be of a different nature, tho' they have the ſame external appearance.

After the water is entirely evaporated there remains in the veſſel a ſmall quantity of a very ſharp pungent ſaline matter, which cannot be reduced to any regular form of cryſtals, nor betrays any mark of its being either of an acid, or of an alkaline nature by being put on blue paper.

The water of the ſpring *de Pre* yields cryſtals preciſely of the ſame figure as the former, but in leſs quantity.

Neither of theſe two waters betray any ſigns of their containing iron, by a mixture of the tincture of galls; for they neither turn black nor red, but on firſt mixing become a little turbid and white, after having been kept for ſome hours.

The waters of the fountain *du Salut* are calming and they commonly prove diuretic.

And thoſe of *du Pre* purge without heating. They employ the one and the other for the cure of a variety of diſorders.

The waters of *the Queen's fountain* are very purgative.—In the year 1747 the cold broke ſome bottles of this water, which had ſtood for more than four months, and there was found at the bottom of each bottle, an aſſemblage of an infinite number of brilliant parcels, interwoven one with another, which diſſolved on the tongue like a fine ſubtiliſed earth. Nine grains were gathered out of one bottle.

The different fountains and baths raiſed the quickſilver in Fahrenheit's thermometer to the following heights.

L'Hôpital	86½
Salut petit bain	87
Artigue long, bain frais	88
Salut grand bain	88½
Le Pré ſource temperée	90¾
Laſſere, bain doux	93¾
Le Foulon	93¾
Source de lanes	94¼
Artigue long, vieille ſource deſſous la Galerie	94¾
Bain doux des pauvres à l'Hôpital	94¾
Le Pré ſource chaude	96¾
Legutiere bain temperé	97¼
Laſſerre bain neuf	97¾
Dumouret bain temperé	99¾
Dumouret bain chaud	103½
Fountain nouvelle du bain des Pauvres	108½
Roc des lanes 2d. tuyau	108
Legutiere bain chaud	108¾
Roc des lanes premier tuyau	109
Source de l'Hoſpice des Capucins	110¼
S. Roch	110¾
Bain chaud des Pauvres à l'Hôpital	111¾
La Reine	112½
Bain de Theas	112¾
Laſſerre bain chaud	115¼
Petit Bain	116¼
Bain de Lavedan ou de Mouras	116¼
Fountaine des Pauvres 1. & 2.	117¾
Bain chaud de Lavedan ou de Mouras	118¾
Sallies	122¼

BARBAZAN in the COMINGECIS,

Du Clos ranks this among the hot waters. At Paris it was limpid, and made no other impreſſion on the tongue, except a little roughneſs. While it was evaporating, it threw up a pellicle like to that of lime water. After the evaporation was finiſhed, there remained one five hundred and ſixty-ſixth part of ſediment; which is in the proportion of one hundred and eight grains and a half from the gallon; of this one ſixth, or ſixteen grains and a half were ſea ſalt, the reſt was a white chalky earth.

BOURBON LANCY in the province of BURGUNDY,

Is ſituated near the river Loire, and has long been famed for its baths and mineral waters.

Du Clos ſays, there are ſeveral ſprings at this place. 1ſt. That called *le Lymbe* is the hotteſt.——2d. Next to that is the fountain, called *the Queens*.——3d. Then that of *D'Eſcures*.——4th. And the fountain of *St. Leger*, which is only tepid.

The water of *le Lymbe* brought to Paris had no taſte; it was clear and limpid, and remained ſo when diſtilled in a curcurbit till all the water was evaporated; there was left in the veſſel one ſix hundred and fortieth part of a white ſaline ſediment, which is in the proportion of ninety-ſix grains to the gallon; of this one tenth was earth;

the other nine-tenths a pure ſalt, which on being cryſtallized afforded cubic cryſtals, of the ſhape and taſte of thoſe of ſea ſalt; mixed with a ſolution of corroſive ſublimate, the liquor remained clear, but with a ſolution of ſaccharum ſaturni it became immediately turbid.

Du Clos ſays he found nothing bitumenous or ſulphureous in this water.

The other waters ſubjected to the ſame trials exhibited the ſame appearances.

Monſ. *De Chomel*, in the *Memoirs of the Academy of Sciences for* 1708, alledges, that one pound of the Bourbon Lancy water evaporated yielded twelve grains of reſiduum; of which two grains were earth, and ten grains a ſalt, which by all the trials he made proved to be of a lixivial nature, tho' *Du Clos* had affirmed that it was ſea ſalt.

EVEAUX in the COMBRAILLES in the AUVERGNE.

At this place there are two ſprings; the one of which we already mentioned (la petite ſource) as containing natron. The other, called the Great Fountain, is hot, and *Du Clos* ſays was very limpid and inſipid when brought to Paris; it yielded one ſeven hundred and ſixty-eighth part of reſiduum, or eighty grains from the gallon, compoſed of earth and ſea ſalt.

D'ENCAUSSE in the COMMINGOIS,

Is a tepid, inſipid, limpid water; which, *Du Clos* ſays, has no taſte, except a little roughneſs. Evaporated, it yielded one two hundred and ninetieth part of ſediment, or two hundred and twelve grains from a gallon; of this one ſeventh, or thirty grains were ſea ſalt, the reſt earth.

Dr. *Fabre*[a] ſays, that theſe waters were in great repute in his time, and that people reſorted to them in crowds from all parts of the world; and that they were reckoned particularly uſeful in diſeaſes of women.

ITALIAN WATERS.

Baccius, in his fifth book *de Thermis*, mentions a great number of waters which he ſays contains ſea ſalt, but of which he has given no ſuch particular account that we can form a right judgment, either of their contents or virtues, ſuch as,

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[a] *Vid Hydrograph. Spagyr. lib. 2. chap. 9. Petri Joan. Fabri Toloſæ* 1639.

MOUNT CATINUM in PISTORIO.

Two at the caſtle of *Mount Catinum*, near Piſtorio in Tuſcany, one called *Salmacidas*, which is the ſalteſt, the other *Balneolum*, or little bath, which is ſweeter.

Fallopius gives the following account of theſe waters. He ſays, at this place there are many ſprings and fountains, but two only are in uſe. 1ſt. The little bath (il Bagnuolo)—2d. and the covered bath, called Tectutium or Tettucio.

The waters of both are impregnated with ſalt, but the ſmall bath leſs than the covered one.—They have been called the *Salmacidas* of Piſtorio.

They are both uſed for drinking and for bathing in; the ſmall one for ſtrengthening the ſtomach and the bowels; but principally for cleanſing the firſt paſſages.—The water of the covered bath is a very ſtrong purgative, even when taken in ſmall quantity.

tity.—That of the little bath he found to be one of the beſt remedies for the dyſentery, and ulcers of the inteſtines, drank the length of ſix or eight cup fulls;—the water of the covered bath is uſed for the ſame purpoſe, but in leſs quantity.

Baccius ſays, that theſe waters may be looked upon as a medicine, ſent from heaven, for the cure of the dyſentery; that he has ſeen many, who were extenuated and exhauſted, and whoſe caſes ſeemed to be quite deſperate, recalled, as one may ſay, to life, by drinking from a pound to three pounds of theſe waters in the day.——He recommends them likewiſe in obſtructions of the urinary paſſages, and for the ſtone and gravel.

AQUARIUM.

A water at the town of *Aquarium*, between Rheggio and Modena, which is clear, limpid, and ſaltiſh, and keeps for many years without putrefying.——*Fallopius* alledges that it is impregnated with nitre (probably calcareous Glauber ſalt) ſea ſalt and a marbly or calcareous earth. *Baccius* ſays it operates by ſtool and by urine.

TRESCURIA.

The *Treſcurian* water, ſituated ten miles below Bergoma, in the Venetian territory, is tepid and ſalt; and ſaid likewiſe to be ſulphureous and impregnated with nitre (probably with natron or a calcareous Glauber ſalt, or with both) for he ſays it purges ſome, vomits others, and at other times paſſes off by the urinary paſſages.

Some others of the ſalt waters mentioned by *Baccius*, we ſhall take notice of in treating of the ſalt ſulphureous waters; but the greater part we muſt omit for want of a particular deſcription.

CHAP. IV.

OF WARM WATERS IMPREGNATED WITH A CALCAREOUS GLAUBER SALT.

ALTHOUGH I mentioned ſo many cold waters, which were principally impregnated with a calcareous Glauber ſalt, yet I have not hitherto met with an accurate account of any hot water, wherein it has been found predominant; unleſs in ſuch which were alledged, either to have a ſulphureous ſmell, or to be impregnated at the ſame time with iron; though I make no doubt but that upon a more accurate examination, it will be found to be the prevailing ſalt in many warm waters; and probably ſome of thoſe formerly ſaid to contain alum or nitre, may be found to be impregnated with it.

Baccius mentions ſeveral waters, which, he ſays, are purgative, and contain nitre, which may probably hereafter be diſcovered to be a calcareous Glauber ſalt; ſuch as,

SUCCELLARIA.

A water, in the iſland of Aenaria [a], of a bath called from thence the nitrous.

PAGANELLI, a BATH near VITERBO.

The waters of which purge, and carry off viſcid humours, promote the menſes, &c.

He mentions ſeveral others; but as he has given no accurate deſcription, nor related the experiments he made, we cannot poſitively affirm that their ſalt was a calcareous Glauber; but in the Padua edition of *Baccius*'s book, publiſhed in 1711, there is added a collection of tracts of other authors, on mineral waters, in which we have an account of the waters of Villa in the territory of Luca, which contain this ſalt, and which we ſhall here conſider, tho' they are alledged to have a ſulphureous ſmell, and therefore according to our plan ought more properly to have been brought under the head of ſulphureous waters: but I ſhall firſt give *Fallopius*'s account of them.

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[a] See lib. 5. p. 163.

BATHS OF LUCA.

VILLA AND CORSENA.

In the territory of Luca are ſeveral baths and ſprings.

Fallopius [a] gives the following account of them.

About fifteen or ſixteen miles from Luca is the bath of Villa, the water of which has been ſaid to be impregnated with different minerals, but which he found to contain only a ſmall quantity of alum; but which, ſince his time, has been found to be a calcareous Glauber ſalt.

He ſays, this water bears carriage, and will keep a very long time; and he recommends it as an aſtringent in pulmonary hæmorrhages.

About a mile from Villa is Corſena, which is fifteen miles from Luca.—Here there are three baths.—1ſt. The hot bath.—2d. The bath of St. John.—3d. The pump bath. There was formerly a fourth, called the red bath, but that has gone to ruin.

He ſays, the water of the hot bath was ſaid to contain ſulphur, alum, and nitre;

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[a] *Gab. Fallopii Tractat. de Aquis mineral.* fol. 81 and 82.

but from the trials he made, he thinks they only contain a ſmall portion of ſalt, much nitre, a calx, and but a very little of a ſulphureous vapour, for he thinks the water is warmed by paſſing over the hot ſtones and rocks.

The waters of the bath of St. John is a ſweet, pure water, fit for drinking, and contains no mineral.

The water of the pump bath (Balneum de Ducciis) contains a little nitre, burnt marble, and no ſulphur; this bath yields fourteen ſtreams or falls for bathing or pumping diſeaſed parts.

And there are vapour baths (Stuphæ) here, for ſweating in.

He recommends theſe waters much in nervous complaints, and gives great praiſes to the uſe of the falls of water from the Balneum de Ducciis on the head, in deafneſs and other complaints of the ear. He ſays, he twice recovered his hearing by theſe means; and that tho' the water is ſo hot, as to bring the feathers off a fowl, yet that people can bear the fall of it on the head without any hurt; it had the feel to him, when he uſed it, as if a rod of red hot iron had paſſed over his head.

Since chemiſtry has been more cultivated, and more certain experiments have been uſed to determine the nature and contents of mineral waters, we have the following account of the waters publiſhed by Dr. *Zambecari*[b].

The water at Villa, in the fountain called *Pozzetto*, raiſed to forty-one the liquor in a thermometer of fifty degrees, in which the thirty-ſeventh degree was equal to the human heat[c].

An unctuous or bitumenous matter falls to the bottom of the bath.—A tartareous cruſt, which has the taſte of nitre, ſticks to the inſide of the pipes through which the water runs;—and when the water in the bath is agitated, a number of air bubbles riſes to the ſurface.

This water turns milky and turbid with oleum tartari per deliquium,—white with a ſolution of ſublimate,—and yellow with

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[b] *Vid. Additament. ſive lib.* viii. p. 364. *Baccii de Thermis, edit. Patavii, Anno* 1711.

[c] Hence the heat of this water would have raiſed the quickſilver in Fahrenheit's thermometer to one hundred and ſix and $\frac{14}{37}$s, if the ſcale begun at the ſame point with it; but only to one hundred and two $\frac{34}{37}$s, if the freezing point was 0, and it begun afterwards from thence.

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a ſolution of green vitriol;—but it is not affected with galls or with a ſolution of alum.

Evaporated, nineteen pounds yielded fourteen denarii weight of ſediment, which is in the proportion of above three hundred and fifty-three grains, or five drachms two ſcruples and thirteen grains from the gallon [d].—The inſoluble part of which was an earth, mixed with gypſeous or ſhining talcy matter; and the ſaline part, when chryſtallized, ſhooted into cubic chryſtals of ſea ſalt, and chryſtals reſembling thoſe of Liſter's calcareous Glauber ſalt, which ſhould ſeem to be what *Fallopius* had taken for alum.

The other baths, called by *Baccius* the baths of Corſena, are the *Bagno caldo*, which is the hotteſt, and raiſed the thermometer to forty-four, after it had been mixed with cold water.—The bath of St. *John*, which raiſed the thermometer to thirty-ſeven, and the bath called *Barnàbo*, which raiſed it only to thirty-ſix.

He ſays, they are all of the ſame kind; that they have a ſulphureous ſmell, let fall a bitumenous matter to the bottom of the baths, and have a ſine thin unctuous ſcum ſwimming a top.

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[d] This computation is made on the ſuppoſition that the *Denarius* is equal to our *Drachm*.

BATH OF ST. PHILLIP,

Situated near the caſtle of RHODICOPHANUM, twenty miles from SIENA in ETRURIA or TUSCANY.

Probably the water of this bath may be found, on examination, to be impregnated with this ſalt, and to belong to this claſs; for *Baccius* ſays, it is hot, clear, and inodorous, and impregnated with nitre; by which he probably means, either a calcareous Glauber ſalt or natron.—He obſerves that ſome writers have erroneouſly alledged, that this and the bath of *Ruſelli* or *Roſetta* was the ſame.

WARM WATERS.

CLASS II.

OF WATERS WHICH CONTAIN A FOSIL OIL OR SULPHUR.

CHAP. I.

OF WATERS WHICH CONTAIN A FOSSIL OIL.

IN treating of cold mineral waters, we obſerved, that foſſil oils were, for the moſt part, found either ſwimming on the ſurface of water, or ſunk to the bottom of the wells; and that often ſuch waters were quite pure, and did not ſeem to be much affected by theſe oils, though at other times they were more intimately mixed; in like manner foſſil oils are found, either ſwimming in, or mixed with hot waters; and ſuch hot waters uſed as baths, have been reckoned more efficacious in the cure of cutaneous diſorders than any others. Many ſuch waters are mentioned by authors, but few or none particularly deſcribed, where theſe oils have been found in large quantity, and therefore we ſhall only mention a few of thoſe that are taken notice of by *Baccius*, in his *Lib.* v. *de Thermis*, where he enumerates moſt of the fountains abounding with foſſil oils, obſerved by thoſe who went before him; and one or two from other authors; which are,

ITALIAN.

PERUSIA,
BATH of PETROLEUM near BAIA,
CULMA,
PUTEOLI,
PICENUM.

ASIATIC.

TRALLEIS.

FRENCH.

AIGUESCAUDES.
PLOMBIERES.

PERUSIA.

At Peruſia, ſituated on the eaſt ſide of Etruria, on the river Tiber, about eighty miles above Rome, is a bitumenous bath, which *Baccius* ſays was formerly in much repute.

BATH

BATH OF PETROLEUM.

In the Campania near to Baia, at the monaſtry of the Sancta Maria, is a bath called the *Petroleum*, on account of its being impregnated with a foſſil oil, and a quantity of it ſwimming a top of its water. —*Baccius* ſays, this bath is famous for drying and curing many cutaneous diſorders.

He obſerves, that there are ſeveral other baths at this place, which have more or leſs of a foſſil oil ſwimming on the ſurface of their waters.

CULMA.

A bath near to the lake Avernum, in the Campania; the water of which, he ſays, taſtes ſtrongly bitumenous, and is uſed for the ſame purpoſes as the baths at Baia.

PUTEOLI.

At this place, *Baccius* ſays, there are likewiſe baths impregnated with a bitumenous matter, which are famed for their curing cutaneous diſorders, ſuch as thoſe of *Plaga*,—of *Petra*,—of the *Fontanella*, beſides many others.

PICENUM.

At the caſtle of Petrioli, in the county of Picenum, are ſprings of hot waters which are impregnated with a petroleum or foſſil oil.

ASIATIC.

TRALLEIS.

Baccius tells us, that at this place, which is ſituated near the river Charamene, and the town of Niſſa, there is a hot fountain with bitumen.

FRENCH.

AIGUESCAUDES.

At Aigueſcaudes, in the valley of Oſſau, in the principality of Bearn, Mr. *Buſching*[a] ſays, there is a hot ſpring containing a water of a ſoapy, ſpiritous, oily nature, which has a ſmell reſembling that of a bad egg.—It is reckoned an excellent vulnerary, and is alſo uſed with ſucceſs for inward diſorders.

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[a] See his Syſtem of Geography.

Tepid Saponaceous WATER *of* PLOMBIERES.

Theſe waters, ſituated in the country of Lorain, are very near to the cold water of the ſame name, which we formerly mentioned. Monſ. *Malouin* has given us the analyſis of the cold water, by which it appears, that they contain both an alkaline ſalt, and an oily or bitumenous matter, as well as an earth; and tho' he has given us no particular account of this, it is probable that on trial it will be found to be impregnated with matters ſimilar to that of the cold.

Monſ. *Geoffroy*, in the firſt volume of his *Materia Medica*, ranks this among the waters impregnated with an earth.

He ſays, at the fountain it was limpid, tepid, and had a ſaponaceous or fattiſh taſte, with a ſlight roughneſs; that it contains a fine fat argillaceous earth like ſoap, which has made it be much recommended for complaints of the ſtomach which proceed from ſourneſs, in the hæmoptoe, in hæmorrhages, phthiſis, aſthma, aſcites, diabetes, fluor albus, dyſentery, and in all cutaneous diſorders;

and it is uſed with ſucceſs both externally and internally.

Externally it deterges and dries ulcers; internally it is laxative and diuretic.

It is drank from a pint to three quarts on an empty ſtomach, in the morning.

CHAP. II.

OF WARM WATERS WHICH HAVE A STRONG SULPHUREOUS SMELL.

IN conſidering hot waters, which have a ſtrong ſulphureous ſmell, we ſhall firſt take a view of thoſe—1ſt. Which contain a native alkaline ſalt or natron.—2d. Thoſe which contain ſea ſalt.—3d. Thoſe which contain a calcareous Glauber ſalt.—4th. And laſtly, thoſe which yield but very little ſolid matter when evaporated; and likewiſe ſome which are mentioned, but not particularly deſcribed by authors; and we ſhall refer thoſe which contain iron till we come to take a view of hot chalybeate waters.

I.

OF SULPHUREOUS WATERS, WHEREIN A NATIVE ALKALI OR NATRON IS THE MOST PREDOMINATING SALT.

The hot ſulphureous waters, impregnated with the native alkaline ſalt, have nearly the ſame general virtues and properties as the cold waters belonging to the ſame claſs; drank in ſmall quantity, they prove diuretic, and ſtrongly diaphoretic; and when they contain much of the ſalt, and are drank freely, they both purge and vomit. Uſed as baths, they clean, ſoften, and relax the ſkin, and have been eſteemed particularly ſerviceable in cutaneous diſeaſes.

The diſorders in which they have been moſt uſed, we ſhall mention when we treat of the particular waters.

Thoſe we ſhall conſider at preſent are,

GERMAN.

AIX LA CHAPPELLE,
BORSET,
CHAUDE FONTAINE.

ITALIAN.

VALDERIAN.

AIX LA CHAPELLE, OR AKEN,

Is a large imperial city in the dutchy of Juliers, which has long been famed for its hot ſulphureous waters and baths. It was formerly called Aquis Granum, ſuppoſed to have taken its name from Serenius Granus, lieutenant general of Gallia Belgica, in the reign of the Emperor Adrian, who firſt diſcovered the hot ſprings here about the year 53, and built baths, and beautified them after the manner of the Romans.

There are ſeveral ſprings which furniſh theſe ſulphureous waters, of which Dr. *Lucas* mentions three principal ones.

1ſt. The *Great Source*, which riſes in a little valley eaſtward of the town-houſe, and throws out ſuch a quantity of water as to ſupply ſeveral baths.

2d. The *Source in the Great Street*, in which is the fountain of the thermal water, which is commonly drank.

3d. The ſource which lies on the ſouth ſide of the great one, and ſupplies ſeveral others of the baths.

Theſe ſources, particularly the great one, are vaulted over; and it is on the upper and inſide of theſe vaults and aqueducts that the fine ſulphur, ſublimed from theſe waters, is collected.

The water from theſe ſources is conveyed by proper pipes or aqueducts to the ſeveral baths in the town; which are commonly reckoned to be eight in number.

1ſt. The Emperor's bath, which is ſupplied immediately from the great ſource.—2d. The little bath.—3d. St. Querinus's bath.—4th. The new bath within the old city.—5th. Carol's bath.—6th. St. Cornelius's bath, or de heeren badt.—7th. The roſe bath.—8th. The comphaus badt, or poor's bath in the new town.

All the Aix la Chapelle waters, near the fountain or ſource, are quite clear and pellucid; and ſtrike the noſe with a ſtrong ſulphureous ſmell, reſembling that of the waſhings of a foul gun, or that which ariſes when an acid is mixed with a ſolution of hepar ſulphuris, or when oil of vitriol is dropt upon iron.

Upon ſtanding to cool this ſmell goes almoſt entirely away, yet not ſo much as to be entirely loſt, immediately upon cooling; for if the water be ſoon after put on the fire, the ſmell returns as ſoon as it begins to heat, and continues till all the volatile parts are evaporated; and the ſame thing happens, if the water be long expoſed to the open air.

The taſte has been compared to that of rotten eggs, but it is ſomewhat ſaline, bitter, and lixivious or urinous; Dr. *Lucas* thinks it comes neareſt of any thing to the taſte of a weak ſolution of hepar ſulphuris.

When the water is let ſtand to cool, we very ſoon obſerve a number of minute fine particles floating every where through it, and it then begins to loſe its brightneſs and pellucidity; as it cools it acquires a milky, turbid appearance, and lets fall a light pale earthy ſediment; while an aſh-coloured, ſoft, unctuous feeling pellicle ariſes, and ſpreads itſelf over the ſurface. This ſediment, which falls to the bottom of the baths, is at firſt of a pale aſh-colour; but if let remain, it grows ſo black as to have the appearance of an æthiops mineral. The colour of this ſediment has made *Berger*

ger alledge, that it was mixed with an ochreous matter; but Dr. *Lucas* affirms, that he tried it with galls, with green tea, with an infuſion of red roſes, and by other means, but could diſcover no ſigns of its containing the leaſt particle of iron; and that it proved to be a calcareous earth, mixed with a ſmall portion of ſulphur, which had been generated by the vapour, and fallen back into the bath.

The water, as taken up immediately from the ſpring, does not at firſt change the colour of the ſyrup of violets, but in about a minute turns it to a green; and after it has ſtood till its volatile parts are evaporated, if mixed with the ſyrup of violets, it immediately effectuates this change of colour.—This ſhews that the water, as it riſes from the ſpring, is in a neutral ſtate; but that as ſoon as the volatile principles evaporate, an alkaline ſalt is prevalent. This is the reaſon why, at ſome diſtance from the ſources, this water is found to ſerve for ſcouring wool and woollen cloaths; and to be ſo uſeful in waſhing linen, as to ſave both ſoap and firing; and why it ſoftens and improves the taſte of greens boiled in it, and why it effervefces with acids; however, this laſt is not always a certain proof of waters containing an alkali, as fixed acids diſlodge the volatile from waters, and cauſe a kind of effervefcence, at the time they are firſt mixed with waters thus impregnated.

The heat of the water in the ſource of the Emperor's bath raiſed Fahrenheit's thermometer to one hundred and thirty-ſix— The heat of the other baths, from one hundred and twenty-eight to one hundred and twelve, according as they were more or leſs diſtant from the ſprings.

The weight of the water, in the Emperor's bath, is very little more than that of diſtilled water heated to the ſame degree; for a phial, which contained two ounces, eight ſcruples, and ſeven grains of diſtilled water, heated to one hundred and thirty-ſix degrees, when filled with the water of the Emperor's bath, weighed only three grains more; ſo that this water is about a ſcruple in the pint heavier than diſtilled common water; however, it ought to be obſerved, that the different temperature of the atmoſphere, and other circumſtances, make frequent variations of the exact heat and weight of the Aix la Chapelle waters.

Theſe waters contain of volatile principles a *mineral ſpirit*, and a *volatile acid* and *phlogiſton*, the exiſtence of which is proved by the following obſervations and experiments.

1ſt. If bottles be filled with this water at the ſource, and be immediately well corked and ſealed, an empty ſpace, filled with nothing but air, appears at the top of the bottles, when the water becomes cold [a]; which is partly owing to the evaporation of the volatile principles, though the condenſation of the water by cooling may contribute much to this.

2d. If a piece of linen be dipt in a lixivium of tartar dried at the fire, and then ſuſpended in the vapour of any of the baths for a few hours, the alkaline ſalt in the linen will be found to be ſaturated with a vitriolic acid, and upon lixiviation will will yield a tartarus vitriolatus; which ſhews that theſe waters contain a vitriolic acid which is in a volatile ſtate.

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[a] This ſpace, obſerved upon cooling, leads us to mention a very proper caution to be uſed in bottling theſe waters for carriage to diſtant places; which is, that the bottles ſhould be firſt filled at the ſource, then inſtantly ſtopt, and laid on their ſides, and as ſoon as they are cold, they ſhould be ſeverally filled out of one or more of themſelves; then carefully corked a ſecond time, the neck dried, and dipt in melted cement, and covered with ſoft leather or bladder; and by theſe means all the volatile parts, that poſſibly can be, will be preſerved.

3d. The water of the bath reduces lead to a ſtate not unlike lead-ore, or lead fuſed with ſulphur; it tinges and corrodes braſs and ſilver, and heightens the colour of gold. And the vapour of the baths produces the like effects in a much ſhorter ſpace of time. Hence Dr. *Lucas* ſays, it is evident that the water contains a phlogiſton, or inflammable principle, in a volatile ſtate; which, riſing along with the volatile acid, produces effects ſimilar to thoſe produced by ſulphur; and that it is theſe two volatile principles which meet and unite, and form the ſulphur found on the vaults of the cloſe covered ſources, and conduits of theſe waters; for that no ſuch real ſulphur was originally diſſolved and ſuſpended in the waters, as has been commonly believed; which he thinks he has proved by the arguments we formerly mentioned, when we treated of the exiſtence of ſulphur in waters, where we mentioned the different arguments and proofs which have been brought for and againſt the exiſtence of this ſubſtance in mineral waters. But although he will not allow that any real or actual ſulphur is diſſolved in theſe waters, yet he obſerves, that they are impregnated with the principles of ſulphur in a volatile ſtate, and ſo far united as to produce many of the effects of real ſulphur.

4th. What is a further proof of the principles of ſulphur being in a volatile ſtate is, that their original acid may be diſlodged by any of the fixed mineral or vegetable acids; and that the water loſes entirely its ſulphureous ſmell, and other properties of a ſulphur water, by being long expoſed to the open air, or by being brought to and kept for a little time of a boiling heat; and hence it is that greens or other vegetables acquire no nauſeous, or diſagreeable ſulphureous ſmell by being boiled in theſe waters.

Dr. *Lucas* attempted to collect their volatile parts by diſtillation; but that not ſucceeding, he got a large earthen matraſs perforated at the bottom, which he fixed above the hole in the aqueduct through which the ſteams riſe to ſupply the vapour bath: he then ſet on the head; and having adapted a receiver, and luted the junctures, he let it remain there from nine o'clock in the evening till four o'clock next morning; when, upon ſeparating the receiver, he found between one and two ounces of a colourleſs water in it, which had ſeveral little white flocculi, not unlike thoſe obſerved in the water, floating in it. This liquor had a ſtrong ſulphureous ſmell, and a diſagreeable, ſubacid, and ſubaſtringent taſte, ſomewhat reſembling that of a chalybeate water; though upon trial it was found to contain no iron; it was of the ſame weight as diſtilled water: it ſuffered no ſenſible commotion with mineral acids; it underwent no perceptible change with either the fixed or volatile alkalies in a fluid ſtate, though they heightened its ſmell; but a ſmall efferveſcence enſued on being mixed with theſe alkaline ſalts in a ſolid form, though not much more than is occaſioned by common water.—Poured on filings of iron, in a glaſs, a motion of ſolution commenced; mixed with a few drops of a ſolution of ſublimate mercury, a milkineſs enſued; and with a ſolution of ſilver, a milkineſs with a colour of Moſelle wine; with a ſolution of lead in diſtilled vinegar, a milky opacity and cloud, and a precipitate of a muddy colour, immediately followed; mixed with ſyrup of violets, it occaſioned no change but dilution, for ſome hours; though afterwards it ſtruck a roſe purple: all which ſhew that this liquor is impregnated with a volatile ſulphureous acid, and a phlogiſton. We are not to imagine, that the whole quantity of the acid, and phlogiſton of the water, were contained in this condenſed vapour; for theſe principles are ſo ſubtile, and volatile, that the greater part eſcapes in collecting them, nor are they to be confined by any art we hitherto know. The quantity of theſe volatile principles has not hitherto been aſcertained, nor do we know any way by which the exact proportion can be determined; indeed if we were certain that they contained the exact proportion of acid, and phlogiſton proper for forming a true ſulphur, and if the quantity of ſulphur ariſing from a given quantity of the water could be known, there would be no difficulty to aſcertain the exact quantity and proportion of each; but as neither of theſe facts are likely to be demonſtrated, we can affirm nothing with certainty relative either to the quantity or proportion of theſe principles in the water.

Theſe waters contain fixed, as well as volatile principles; which are,—*earth*, *ſalt*, and an *oily matter* which is common to all waters.

The earth may be ſeparated from the ſalts by dropping a lixivium of tartar into the recent water; for the alkali having a greater affinity with the volatile acid than the earth, unites itſelf with it, and the earth is precipitated; and what ſhews this to be the caſe is, that when the earth has once ſubſided, no turbidneſs or milkineſs enſues on adding a lixivial ſalt to the water.—Or the earth may be got ſeparate from the ſalts, by allowing the water to cool in the open air; for the acid being volatile, which kept it ſuſpended, evaporates, and the water lets drop its earth.—The lighter parts of this earth ſhew themſelves in form of a ſoft pellicle, on the ſurface of the baths, as the acid evaporates; and this pellicle growing gradually thicker, at laſt becomes heavier than the water, and ſubſides to the bottom of the bath; and as theſe pellicles collect, the water becomes turbid and milky.

It is this pellicle which has long been looked upon as a kind of bitumenous matter, but which Dr. *Lucas* affirms, from experiments made with it, to be only a moſt ſubtilely divided earth, which thus ſinks to the bottom, and helps to form the aſh-coloured earthy ſediment found at the bottom, or coated to the ſides of the baths.

The earth may likewiſe be obtained ſeparate from the ſalts, by evaporating the water ſlowly; for the acid, being volatile, evaporates when the water is expoſed to heat; and as this happens the water grows turbid, and throws up one pellicle after another, which ſubſide to the bottom till all the earth is precipitated: if then the water be taken off the fire, and let ſtand till the earth is all ſubſided, the clear liquor containing the ſalts may be decanted off.

If you go on with the evaporation after the earth has all ſubſided, then you obſerve, that when the water is almoſt exhaled, a ſaline pellicle begins to appear on its ſurface, which ſubſides as the earthy ones did before, and another ſucceeds, till all the water is evaporated; when you have remaining the earthy parts, with the ſaline lying in laminæ above them; when they may be ſeparated by throwing the whole into diſtilled water, to diſſolve the ſalts, and then filtering off the clear liquor.

A pint, of the water of the Emperor's bath, yielded by evaporation from thirty-five grains and a half to thirty-ſeven grains and a half of ſediment; of this about one eleventh part, or a little above three grains, was earth; of which three fifths were calcareous, and diſſolved in acids, and was convertible into quicklime; the other two fifths were an inſoluble ſelenite. The remainder, from thirty-one to thirty-four grains, was a ſaline matter, which by experiments ſhewed itſelf to be compoſed of a mineral alkali and ſea ſalt, ſo intimately mixed as not to be ſeparated; and withal an oily matter, ſuch as is common to all waters.

When theſe waters are evaporated in glaſs or ſtone veſſels, no ochreous earth or other marks of iron are ever to be diſcovered, ed, either in the water or its ſediment; but if iron veſſels are uſed for this purpoſe, the vapour of the water corrodes the iron, and you find marks of it in the ſediment; and Dr. *Lucas* obſerves, that it was in this way that thoſe people were deceived, who have aſſerted that theſe waters contained iron, or were chalybeates.

From a review of the contents of theſe waters, we ſee that they contain a ſubtile mineral ſpirit, and an acid and phlogiſton, both in a volatile ſtate; and that when evaporated, a pint yields from thirty-five grains and a half to thirty-ſeven grains and a half of ſolid matter; one eleventh of which is earth, compoſed of three fifths of a calcareous earth, and two fifths ſelenite; and that the other ten eleventh parts are made up of the foſſil alkali and ſea ſalt, mixed with an oily matter.

As theſe waters flow from their ſources, they are in a perfect neutral ſtate, and we may conſider them as impregnated with volatile principles that produce effects analogous to thoſe of ſulphur; that they contain ſea ſalt and an alkaline ſalt, with a ſmall portion of calcareous and ſelenitical earths, all ſaturated and ſuſpended in the water by means of a volatile acid, and a ſmall quantity of an oily matter which is to be met with in every water.

When they ſtand for any time expoſed to the air, their volatile principles evaporate; their earth precipitates, and they remain almoſt only impregnated with the mineral alkaline and marine ſalt.

Dr. *Hoffman*, in his account of theſe waters, ſays, that they are hot, throw up, and ſtrike to the ſides of their conduits a vaſt quantity of ſtony matter. The pellicle or cream which floats on their ſurface, whilſt they remain warm, is inſipid, and if thrown into the fire, it neither crackles nor melts, but remains fixed.—They make a conflict with acids; and turn milky, and let fall a precipitate with alkalies.—They ſhew no blackneſs with galls, and upon exhalation leave an alkaline, and in ſome degree a neutral ſalt behind them; one pound of the water evaporated left twenty-five grains of ſalt, and five grains of earth.—The waters change the colour of ſilver, which is a manifeſt ſign of their holding ſomewhat ſulphureous;

phureous; and drank at the fountain, they have a purgative virtue.

Dr. *Lucas* obſerves, that the Aix water is at firſt nauſeous and harſh; but by habit it becomes familiar and agreeable; that at firſt drinking it generally affects the head lightly, and where it does not purge, it cauſes a heavineſs and propenſity to ſleep, as do moſt waters which contain very volatile principles, and ſuffer a kind of decompoſition in the ſtomach.

The general operation of this water is, to promote the diſcharges by ſtool and by urine, without any pain or ſenſible irritation, or diminution of ſtrength, while at the ſame time it promotes a free perſpiration, and is ſaid to give a ſoftneſs and laxneſs even to the moſt denſe and arid ſkin.

In a ſhort time it gives a ſulphureous ſmell to the whole body; tinges the linen of a yellow colour; turns ſilver carried in the pocket, firſt yellow, and then black.

Hence we ſee, that it acts as a ſaline ſulphureous water in the firſt paſſages, and promotes the diſcharges by ſtool; at the ſame time that being taken up into the blood, it pervades the minuteſt veſſels of the body, promotes the ſecretions by the ſkin and kidneys, and acts as a very powerful ſaponaceous reſolvent; and as it ſoftens and and relaxes the fibres, it proves a very powerful antiſpaſmodic, both when drank and uſed as a bath.

Theſe waters have been found extremely ſerviceable in thoſe diſeaſes which proceed from indigeſtion, or from crudities or foulneſs of the ſtomach and bowels, and from a ſluggiſh diſpoſition of the humours; for they not only carry off any putrid ſaburra, or fæculent matter that may be lodged in the firſt paſſages, but they likewiſe give a proper ſtimulus to the nerves, increaſe the tone of the fibres, and promote digeſtion; and as they pervade the minuteſt veſſels of the body, they aſſiſt in reſolving any ſluggiſh or viſcid diſpoſition of the fluids, in removing obſtructions, and in reſtoring the natural mildneſs and fluidity to the blood; and at the ſame time determine what particles are unfit to circulate longer to the different excretory organs, to be diſcharged out of the body by ſtool, by urine, or by perſpiration; hence we find them of ſo much uſe in diſeaſes which proceed from leading too indolent and too luxurious a life; in caſes where the chylopoietic viſcera are diſordered, and there are obſtructions which require a continued courſe of evacuations to remove; in ſome particular aſthmatic caſes, which proceed from a viſcid pituit; in the ſcrophula and other diſorders where the glands are ſwelled and obſtructed; in diſeaſes of the kidneys, bladder, and urethra, which are attended with a diſcharge of mucus or viſcid glary ſtuff; in clearing the joints of the remains of gouty and rheumatic diſorders; and in many other diſeaſes which take their riſe from viſcid humours diſturbing the functions of the different organs; and they have been eſteemed particularly uſeful in killing and evacuating worms, and their viſcid nidus.

As they not only poſſeſs the virtues juſt now mentioned, but likewiſe are powerful antiſpaſmodics; they have been found to be good remedies in many hyſteric, hypochondriac ſpaſms, in obſtructions of the viſcera, and in melancholic diſorders that proceed from a vitiated ſtate of the blood.

They have been likewiſe found uſeful in ſpaſmodic contractions of the bowels, and in cholicky pains, attended with conſtipation, eſpecially when aſſiſted with emollient clyſters and warm bathing.

And no remedies have been found more powerful in reſolving gravel and ſtone, and the viſcid humors which give riſe to them, or in preventing their generation.

As theſe waters, when once deprived of their volatile parts by boiling, or by being kept, are only impregnated with the mineral alkali and ſea ſalt, they have been found to be in this ſtate extremely uſeful in removing the heartburn, cholic pains, and other diſorders which take their riſe from acid crudities in the ſtomach and reſt of the alimentary canal. Bathing in theſe waters, at the time that patients are in a courſe of drinking them, has been found to be very efficacious in the cure of many cutaneous diſorders, ſuch as the itch, the herpes, the leproſy, and other foulneſſes and eruptions of the ſkin; in curing cramps, and ſpaſms, and in removing palſies and paralytic complaints, and in curing ſtiffneſs, rigidity, or contractions of particular parts: and the cure of ſuch diſorders is often greatly aſſiſted by the expoſing ſuch diſeaſed parts to the fall of one or more columns of the warm water, by means of pumps, or by expoſing them to the vapour of the water, in what is called the vapour baths; both which are made very convenient, at this place, in ſeveral of the baths in the town.

The drinking and bathing in theſe waters has been recommended as a moſt effectual and almoſt an infallible cure for thoſe evils which follow the injudicious uſe of mercury, or the effects of mercury, which often remain after the venereal taint is gone. —Dr. *Lucas* ſays, they have hardly ever been known to fail of doing eminent ſervice, or of perfecting a cure; for that this water ſoftens and relaxes the ſkin, opens the pores, ſets the mercury again in motion, carries it off by the ſkin, and the other emunctories, and by theſe means relieves the hectic diſpoſition, the cholics, contractions, cramps, feebleneſs and pains of the limbs, and the pains of the head which often remain after ſalivations, and after the too free uſe of mercury, and which are frequently ly more the effects of the mercury, than of the diſorder for which it was given.

Dr. *Lucas* alledges, that ſome patients who who have had recourſe to the uſe of theſe baths ſome months, nay years after uſing mercury, have felt as ſtrong a taſte of mercury as when they were taking it; and adds, that they have ſometimes been known to ſalivate[a] with greater eaſe and freedom than in the time of the mercurial courſe; and that ſome of the phyſicians at Aix la Chapelle have aſſured him, that in ſome caſes they have ſeen the mercury paſs off by the pores of the ſkin in globules.

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[a] Whether this effect of raiſing a ſalivation after the uſe of mercury is to be attributed to any particular efficacy in the Aix la Chapelle water, or merely to the effect of warm bathing, I think it very doubtful. For in ſpring 1768, I was called to a young woman who had venereal blotches and violent nocturnal pains, attended with a conſtant fever, which had reduced her very low, for which ſhe was put under a courſe of mercurial unctions, and ordered to drink the decoction of the ſarſaparilla with the antimonial wine, and to take freely of the bark; this courſe removed all her complaints without affecting her mouth. Some weeks after ſhe had left off the uſe of mercury, when ſhe had recruited her ſtrength, ſhe went two or three times into the warm bath to waſh and clean her ſkin, but it brought on a plentiful ſalivation, which laſted for ſome weeks.

Hence we ſee, in what variety of diſorders theſe waters have been found uſeful, and it would be impoſſible to enumerate every caſe in which they may be ſerviceable; but whoever is acquainted with diſeaſes, and with the nature and properties of theſe waters, will beſt judge when it is proper to adminiſter them.

Dr. *Lucas* further obſerves, that although theſe waters are ſo uſeful in many diſorders, that they are improper in others; that they ought not to be given where the conſtitution is much broke down, and there are extravaſations of fluids in the cavities; where the blood is diſſolved, and too putreſcent; in hectic caſes, where there is much heat and fever, eſpecially where it proceeds from ulcers of the lungs or viſcera; in bilious habits, and thoſe ſubject to eriſypelas, till previous evacuations have been uſed; where patients are ſubject to profuſe hæmorrhages, in putrid diſorders, and, in ſhort, in all caſes where a ſtimulating, heating, alkaline remedy is contra-indicated.

Very little preparation is requiſite for beginning a courſe of theſe waters; people of a plethoric habit ſhould loſe a little blood, but purging is for the moſt part unneceſſary, as the waters of themſelves generally prove purgative; yet in ſome caſes a gentle vomit or a doſe or two of ſome mild purgative medicine may be proper.

It is impoſſible to determine the exact quantity of water to be drank, for this muſt vary according to the age, the ſtrength, the conſtitution, and other circumſtances of the patient.

In general, people ſhould begin with taking but a ſmall quantity, not exceeding half a pint in a morning; and in ſome particular caſes not above half that quantity, though afterwards it may be drank to pints.

When it is judged proper that the water ſhould be drank in its higheſt perfection, it ſhould be drank at the fountain, and the patient walk about a little after each glaſs; but if the patient is very weak, it may be drank at home, or even in bed.—Ten or fifteen minutes ſhould be interpoſed between each glaſs, according as the ſtomach is able to retain it, or it paſſes off without inconvenience.

Where cleanſing the firſt paſſages is the chief thing in view, the water ſhould be drank in large and often repeated draughts. Some are purged with a quart, or three pints, whilſt others are not thus affected with a gallon.—Where it purges, its operation is to be limited by the number of glaſſes, for every glaſs after the firſt motion generally occaſions another.

When the water does not purge, it paſſes off by the urinary paſſages, or the ſkin; and when it is given to promote theſe ſecretions, it is to be taken in ſmaller quantity, and in longer intervals between the draughts.

In many chronic diſorders, where the waters are ordered as alteratives, they may be drank not only in the morning, but at midday, and in the evening; and in caſes where the digeſtion is bad, and the patient troubled with acidities, a glaſs or two may be drank after meals.

Weakly or emaciated people may very conveniently mix a gill of mare's or aſs's milk with the firſt glaſs of the water, or may mix a little cow's milk with each glaſs, by which means the waters will ſerve both as reſtoratives and alteratives.

When the water, deprived of its volatile parts, is thought to be more proper, than when it is in its full perfection, it may be boiled, or let ſtand all night in an open veſſel; in this form it is alledged to be leſs diaphoretic and more purgative, and has been recommended as a good preparative for drinking the waters in their full perfection.

The general regimen people ought to purſue during a courſe of the waters is, to drink the waters early in the morning, and to eat nothing till ſome time after that is over, and the ſtomach is quite empty of them; then to eat a light breakfaſt of gruel, chocolate, milk, broth, tea, or coffee. In about an hour after breakfaſt to uſe moderate exerciſe, either in a carriage, on horſeback, or a-foot. To dine about one or two o'clock, on ſome light, eaſy digeſted nouriſhment, ſuch as is not contra-indicated by the nature of the waters; of which kind are light ſoops and broths, freſh meat, or fiſh plainly dreſſed, ſome of the milder vegetables in moderate quantity. To uſe for drink ſuch liquor as beſt ſeconds the operation of the water; of which kind are the Seltzer or Bonn water, or the Aix la Chapelle water itſelf after it has been cooled.—Such as have been accuſtomed to fermented liquors may drink a few glaſſes of ſome generous wine; to walk or ride a little in the evening; to ſup early, not later than eight or nine o'clock, and then to eat only of ſome light thing, ſuch as gruel, panada, broth, a piece of dry toaſt or biſcuit, with a glaſs of wine, or ſome ſuch light thing: to go to bed early, and get up in the morning, taking more or leſs ſleep as is found requiſite.

Sleep in the day-time, and eſpecially after meals, has been found to be prejudicial, and therefore ought not to be indulged. Moderate exerciſe, and agreeable innocent amuſements, are abſolutely neceſſary; but all ſuch as heat or fatigue the body, or command too cloſe attention and application of the mind, are found to be prejudicial.

With reſpect to the uſe of baths, this muſt be determined by the ſeaſon, the age, the ſex, the ſtrength, and conſtitution and preſent circumſtances of the patient.

The degree of heat of the bath ought to be conſidered; the tepid baths are in general the moſt advantageous, though there are ſome caſes in which the hotter ones are moſt proper; but even in ſuch caſes it is for the moſt part beſt to begin with temperate baths, and gradually to enure the body to a greater degree of heat.

The time of remaining in the water muſt be determined by the heat of the bath, and the particular circumſtances of the patient: in common, people ſtay in the bath from fifteen minutes to an hour.

After bathing it is proper for the patient to go home to his chamber, and there remain for ſome time; and where ſweating is thought proper, he ſhould go to bed and promote it for half an hour, more or leſs.

BORSET.

About half a mile from Aix la Chapelle is ſituated the village of Borſet, or Bordſcheit, where there are ſeveral hot ſprings; the two moſt remarkable are;—1ſt. The lower. —2d. The upper.

1ſt. The water of the *lower ſpring* approaches near to the nature of that of Aix la Chapelle; but it ſmells and taſtes ſo little of ſulphur, that it is not generally looked looked upon as a ſulphureous water; however,

ever, Dr. *Lucas* informs us, that he gathered one morning from the vaults of its ſource and conduits, three drachms of a pure ſulphur, and that from a number of experiments it appeared to be a water impregnated nearly with the ſame principles, but to contain rather more acid and leſs phlogiſton: it contains about one half grain more of calcareous earth, and one half grain leſs of lixivial muriatic ſalt in two ounces of ſolid contents than the Aix water; and it raiſes Fahrenheit's thermometer to one hundred and thirty-two degrees.

Dr. *Lucas* thinks, that it may be uſed preferable to the Aix water in ſome particular caſes, which require a water that contains more acid and leſs of the inflammable principle.

2d. The *upper hot ſpring* is ſituated in the great ſtreet: its water appears to be exceeding bright and pellucid; but upon examining narrowly, it is found to have a number of particles floating in it: it has no ſenſible ſmell, but is bitteriſh and lixivial to the taſte. In the little ſource it raiſed Fahrenheit's thermometer to one hundred and forty-four, and in the great ſource or baſon to one hundred and fifty-two, which is ſixteen degrees above what the quickſilver roſe, when the thermometer was put into the Emperor's bath; and it weighs about three grains in the pint leſs than the water of that bath.

Though it has no ſenſible ſmell, yet it is not devoid of active volatile principles, as is evident both by obſervation and experiment, for its vapour corrodes lead rather more powerfully than the Aix water, as is evident by the fine black powder that is found on the inſide of the leaden covering of the aperture made for the vapour bath, and from this covering not laſting quite two years; and this ſhews, that the acid is not entirely cleared of its ſulphureous principles, though it ſeems to be but in a very ſmall proportion.

It deſtroys linen, but more ſlowly than the Aix water; it corrodes iron, and it ſaturates an alkaline ley, with which linen rags have been wet; though it is very difficult to obtain the neutral ſalt produced from thence; becauſe the great quantity of moiſture which exhales is in danger of waſhing all away, unleſs great care be taken.

Its vapour, collected in the ſame manner as that of the Aix water was, did not ſeem to differ from common diſtilled water, when examined only by the ſenſes; but on mixing it with ſyrup of violets it ſtruck a roſe purple; with filings of iron it raiſed an effervescence with air bubbles, and a ſolution ſeemed to commence with alkalies; in a dry form it cauſed a ſmall ebullition and a ſlight milkineſs, which all are ſtrong proofs of a ſubtile volatile vitriolic acid; but as this water has no ſulphureous ſmell, and as no ſulphur is to be got from the vaults of its ſources or conduits, and that neither the water nor its vapour change the colour of white metals, it ſeems to contain but a very ſmall portion of a volatile phlogiſton.

This water, expoſed to the air till it cools, throws up a pellicle, abates of its pellucidity, coats the veſſel at the ſurface of the water, and lets fall a pale earthy ſediment, though the bottom of its natural channel is of a black colour; which Dr. *Lucas* imagines to be owing to a mixture of ſome foreign matter; though I think that this colour is moſt probably cauſed by the ſubtile phlogiſton of the water united to the earthy matter that is precipitated.

Wherever this water runs in a ſtream, it forms concretions of a firm ſtony conſiſtence; in running through a pipe it forms a tubulous incruſtation, and in a ſhort ſpace of time fills the whole cavity, and forms a ſtony cruſt round whatever ſubſtances lye long in its ſtream.

By being heated above its natural degree, it grows turbid, and depoſits its earthy parts.

It gives no tinge with galls; but with ſyrup of violets it at firſt ſtrikes a purple hue, which immediately diſappears; and after four or five minutes, it changes to an obſcure green, and in twelve hours appears to be of a ſad yellowiſh green.

When cold, or when it has cooled after being boiled, it inſtantaneouſly gives marks of a water impregnated with a foſſil alkali, and ſea ſalt.

This water evaporated gave the ſame appearances as the Aix la Chapelle water, excepting that it has no ſmell of ſulphur. A pint yielded thirty-two grains of ſolid contents, of which two and a half were earth, partly calcareous, partly ſelenite, and twenty-nine grains and a half were a ſaline matter made up of a mixture of the mineral alkali and of ſea ſalt.

From this account of theſe waters, they ſhould ſeem to be proper remedies to be uſed in caſes where a water, leſs impregnated with a fine phlogiſton than the Aix la Chapelle water, is wanted.

They have not hitherto been drank for the cure of diſeaſes, from an unaccountable notion of their being impregnated with alum; though they ſhew no ſigns of an aluminous water, by any experiments that have been made. They have been much uſed as baths for the ſame diſeaſes as the Aix waters, and in anaſarcous and œdematous caſes.

It is common for the farriers to bath horſes up to the belly in them, for removing the greaſing of the legs and feet. They are ſo inoffenſive to fiſhes, that they live in them; and there is not a better breeding pond than one which is ſupplied with theſe waters, while it is ſtill as hot as the human blood; they grow to an enormous ſize in a ſhort time, but they are not thought to be ſo firm and agreeable to the taſte, as thoſe bred in cold water, till after they have been put into a cold pond, at ſome diſtance, for ſix months; after which they are found to be equal in firmneſs to any of the country.

CHAUDE FONTAINE.

About two leagues from Liege, and three from Spaw, and eight or nine from Aix la Chapelle, are the baths of Chaude Fontaine, ſituated on the banks of the river Weze, or Veze.—It is long ſince this place had the name of Chaude Fontaine, which ſhews that its waters have been long known; but it was only about the year 1713 that they came into repute; and ſince that a large houſe has been built, with forty baths, nearer the original ſources of the water than the old ſpring; and four large wells have been dug to ſerve as reſervoirs to ſupply the new baths.

At a hundred and fifty paces from hence, in digging the foundation of a houſe, another ſpring of water was found, which without being warm ſoon acquired reputation.

Monſ. *Chrouet* [a], who gives this account of the ſituation of theſe waters, likewiſe analyſed them, and gives the following account of them.

The water of the old ſpring is tepid and very limpid; its taſte is ſaltiſh, and it has a ſlight ſmell of ſulphur.

He diſtilled the water, and the firſt which came over was inſipid, and ſmelt a little of ſulphur; and having evaporated the remainder, and filtered it through paper, he got a little of an alkaline ſalt, and a ſticky or ſtiff earth (terre gluante).

He then tried theſe reſidua with a decoction of galls, and with a loadſtone; they turned the decoction of galls white, and the loadſtone did not attract the leaſt particle of matter to it; from whence he concludes, that theſe waters contain no iron.

He next rubbed a portion of the reſidua with nitre, and put them on a red hot iron, but they did not detonate or give any other marks of ſulphur; from which he concludes, that they contained no real or actual ſulphur, but only a ſulphureous vapour.

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[a] See *La Connoiſſance des Eaux minerales d'Aix la Chapelle, de Chaude Fontaine & de Spa. Par W. Chrouet, M. D. edit.* 2. *à Liege,* 1729.—N. B. The firſt edition was publiſhed in 1714.

The water of the four new wells is warmer than that of the old, but treated in the ſame manner they yielded the ſame appearances, only they contained leſs earth, and double the quantity of alkaline ſalt that the water of the old ſpring did.

Theſe waters are diuretic, and ſometimes operate by ſtool, but in general, it requires the mixture of a ſmall quantity of ſome purging ſalt, to make them have this effect.

This analyſis of Monſ. *Chrouet* is rather incomplete; he does not ſeem to have made ſufficient experiments with the recent waters, and has not given us an accurate detail of their ſolid contents. All that we can learn from it is, that theſe waters have a ſulphureous ſmell, and contain an alkaline ſalt and an earth, and probably they are impregnated nearly in the ſame way as the waters at Borſet, though in a different proportion.

The college of phyſicians at Liege have called theſe waters chalybeates, which Monſ. *Chrouet* has denied; it is therefore to be wiſhed that we had a more particular account of them.

Dr. *Charles Perry*, in the year 1734, publiſhed an enquiry into the nature and principles of the Spaw waters, in which he mentions this in a curſory manner; he ſays, "On my return from Spaw, my curioſity "led me to viſit Chaude Fontaine, which "is a ſpring of luke-warm water, which "iſſues out of the earth in great plenty, "and is raiſed by four pumps into a large "ciſtern, from whence it is conveyed by "pipes into commodious baths.—I had not "an opportunity of making any other enquiries into the nature of this water than "by the taſte only, which does not ſuppoſe "it to be impregnated in any degree with "minerals, either as to quality or quantity. "And hence, though I allow it to be an "agreeable bath, yet I cannot conceive that "it poſſeſſes any extraordinary virtues or "qualities."

ITALIAN WATERS.

VALDERIAN.

In the country of Piedmont, in the province of Coni, and diſtrict of Valderia, are ſeveral hot ſprings which ariſe from rugged rocks, and have been divided into the *ſuperior* and *inferior*, from their ſituation.—Dr. *J. Fantonus* [b] gives the following account of them.

The waters of the *ſuperior*, or upper ſprings, have been the moſt uſed both for drinking and bathing.—They are ſo hot, that people are obliged to let them ſtand to cool before they drink them, and one can ſcarce hold their fingers in them; but they are hotter at one time than another.

They are clearer and lighter than the water of a neighbouring rivulet, into which they diſcharge themſelves; though they have a ſtrong ſulphureous ſmell, which makes them diſagreeable at firſt to the drinkers; they give no bad taſte or ſmell to bread baked with them. They feel ſomewhat unctuous between the fingers, and when they ſtagnate, the ſulphureous particles attract one another, and are precipitated along with their earth; and therefore we find in the canals by which they are brought to the baths, and in the baths and receptacles, and near the fountains, unctuous or gelatinous concretions; and in the wooden aqueducts we not only meet with ſulphureous, white, and reddiſh flocculi, but likewiſe with a fine white, ſmooth, unctuous matter covering their entire concave ſurface; and other fattiſh or gelatinous bodies (called Muffæ) are obſerved in their channels, adhering to the ſtones, at the places where the ſtream is ſlow. Theſe concretions (after being well dried and burnt) flamed and crackled a little, when a lighted candle was held to them.

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[b] See *Diſſertat. duæ de Thermis Valderianis. Auctore Jo. Fantono Medico ordinar. Regii Princip. Piedmont. edit. Genevæ* 1725.

Theſe waters taken up from the fountain ſtruck immediately a green with the ſyrup of violets, they brightened gold, and turned ſilver black. They became turbid and white with a ſolution of ſublimate mercury, but ſuffered no change with galls or ſpirit of ſal ammoniac.

Spirit of vitriol, poured a little freely into them, occaſioned a precipitation of a whitiſh earth, to about the quantity of two grains, but on repeating the experiment ſcarce any terreſtrial particles ſubſided.

Dr. *Fontanus* made ſeveral parcels of theſe waters be carried to Turin, and examined them at the end of a month. In one parcel there was a number of aſh-coloured membranes, like cobwebs, ſwimming in the water; in another the water was white and turbid: there were but few pellicles, and there had precipitated a white mucus-like matter. In others, which had been kept in well ſtopt veſſels, the water was either clear and pellucid, or had only ſome fine membranes floating in it, and had ſcarce any ſmell of ſulphur.—He ſays, the water, after being kept ſo long, gave fewer marks of an alkali than when freſh; for it did not turn the ſyrup of violets ſo green as before, but only to a blueiſh green, and it was not changed by the ſolution of ſublimate. Oleum tartari per deliquium produced no change; and it became firſt pale, and then turbid, and white with ſaccharum ſaturni.

The Valderian water evaporated, left a ſubacrid ſaltiſh ſediment, which was of different colours according to the degree of heat uſed in evaporating; for ſometimes it was reddiſh, and ſometimes of an aſh-colour; it fermented with all acids, and by lixiviation yielded an urinous ſalt, of which there was ſcarce one grain in ten ounces of the water, and about three times that quantity of an inſipid earth.

The ſalt reſtored the colour to blue paper that had been made red with acids; it turned a clear ſolution of ſublimate mercury turbid and whitiſh; and a ſolution of ſaccharum ſaturni ſtill more ſo; and efferveſced and diſſolved in ſpirit of vitriol.

Hence we ſee that theſe waters, which ſmell and taſte ſulphureous, contain about fifty-one grains of ſolid matter in a gallon, of which near thirteen grains are an alkaline ſalt, and above thirty-eight grains an inſipid earth.

They in general prove diuretic when drank; but ſeldom operate by ſtool, unleſs ſome purgative ſalt be taken along with them.

Both drinking theſe waters and bathing in them have been recommended in many diſeaſes; in diſorders of the ſtomach and bowels; in obſtructions of the viſcera; in the jaundice; in caſes of viſcid matter, or ſand lodged in the kidneys or bladder; in ſome feveriſh complaints; in cutaneous diſorders, and in many other caſes.

From this account of the Valderian waters, they ſhould ſeem to reſemble many of the cold ſulphureous waters formerly mentioned, which we obſerved to have whitiſh bodies floating through them; that they precipitated a ſludge to the bottom of their wells, and depoſited a white raggy matter on the graſs, and on leaves of trees, &c. over which they run.

There are ſeveral other ſprings at this place, ſome of which have been called the vitriol hot waters; but upon trials with galls and other things, he ſays, he could not diſcover the leaſt ſign of a chalybeate impregnation. And on the oppoſite ſide of the rock are three other fountains of warm water; one called the St. Lucia, another la Garagua, and the third has no name.

He ſays, they are all ſulphureous and nearly of the ſame nature as the one already mentioned.

CHAP. III.

OF HOT SULPHUREOUS WATERS WHICH CONTAIN SEA SALT.

WHEN we treated of cold waters, we mentioned ſome which had a ſtrong ſulphureous ſmell, in which ſea ſalt was the prevailing ſaline matter in the ſediment left after evaporation; and at preſent we ſhall conſider two or three hot ſulphureous waters, in which this ſalt has been found; which are,

FRENCH.

BAREGE.

ITALIAN.

PADUA.

GERMAN.

BADEN BADEN.

FRENCH WATERS.

BAREGE in the BIGORRE.

At this place, Dr. *Le Monier* ſays[a], there are ſeveral ſprings of hot water which form four warm baths.——The royal is the hotteſt, and raiſes *Reaumeur*'s thermometer to forty degrees, which is equal to one hundred and twenty-two of Fahrenheit's. The ſecond raiſed *Reaumeur*'s to thirty-four (or Fahrenheit's to one hundred and and eight and a half). 3d. To thirty-three and a half (or Fahrenheit's to one hundred and ſeven and three eighths). 4th. To twenty-nine (or ninety-ſeven one fourth).

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[a] *Mem. de l'Acad. des Sciences à Paris* 1747. *Edit.* 8*vo. p.* 105, *&c.*

The royal bath is ſo hot that one ſupports its heat with difficulty; and therefore it is almoſt only uſed for waſhing, and dipping diſeaſed parts into; but the heat of the others is ſupportable, and people remain for a time in the baths.

The water that ſupplies theſe baths, as it riſes from the ſprings is clear and tranſparent as the pureſt water; but by ſtanding throws up a thin pellice reſembling a fine light oil. It has a ſlight ſmell of hepar ſulphuris, reſembling ſomewhat that of an egg boiled hard, when the ſhell is taken off, while it is yet warm. It has a ſoft ſomewhat nauſeous taſte, and feels ſoft to the touch as the moſt perfect ſoap water.

Two pounds of it, taken up in a bottle, did not ferment, but threw up a number of air bubbles; it dropt no ſediment when let ſtand till it was cool, and not even after being boiled.

A matraſs, filled with it at the pump, after being well ſtopt was reverſed, and let ſtand till it cooled; but it did not throw up more air than common water of the ſame degree of heat.

It was not affected with galls or other aſtringents, or with oleum tartari per deliquium, ſpirit of ſal amoniac, lime water, or the ſolution of corroſive ſublimate; nor did it change the colour of ſyrup of violets, or of the tincture of tournſol.

The ſolution of ſaccharum ſaturni rendered it turbid, and produced a white cloud, which precipitated without any change of form. A ſolution of ſilver in ſpirit of nitre formed a brown cloud, which thickened and fell to the bottom, in form of a black matter as tough as pitch; this Dr. *Le Monier* diſcovered to be the ſilver precipitated by means of ſpirit of ſalt, and mixed with a portion of bitumen; melted it formed a true luna cornea a little diſguiſed.

As taken up from the fountain it turned ſilver of a black colour; but it had no ſuch effect after it had cooled, nor after it had been boiled on the fire; however he obſerves, that this property of tarniſhing ſilver is not entirely loſt by theſe means, but only ſuſpended (endormi); for he ſays, that ſixty pounds of the water, after being reduced to a Paris pint by evaporation, and carried to Paris, made the cork of the bottle, in which it was kept, fly on the leaſt effort to draw it; that it ſmelt ſtrong of ſulphur, and had the property of turning ſilver black; and precipitating it from the ſpirit of nitre, in form of a black ſediment, which in a little became white.

Acids fermented but weakly with the concentrated water; they precipitated nothing, and deſtroyed immediately the ſmell of hepar ſulphuris.

Part of this concentrated water, when reduced to about one half by evaporation, exhibited a number of flocculi ſwimming through it, which precipitated in form of a jelly, reſembling the ſperma ranarum, and like to what is gathered in the conduits of the water; and after it was dried it appeared in the form of ſmall filaments; it did not ferment or undergo any change with acids, but burnt like a vegetable ſubſtance, and had ſomewhat of a bitumenous ſmell.

After this mucilaginous matter had been ſeparated, the evaporation was continued, when other flocculi appeared, and precipitated as the former, in form of a ſediment of a thicker conſiſtence, which being ſeparated from the water and dried, reſembled dry potter's earth; this ſediment fermented with the acid of vitriol, and gave a ſmell of ſpirit of ſea ſalt mixed with a volatile ſulphureous acid; put on the burning coals it melted, turned black without decrepitating, and ſmelt ſtrong of burnt leather.

After this ſecond ſediment was ſeparated, the remaining water was evaporated; during the evaporation it did not throw up any ſaline pellicle, but became firſt turbid, and then at once of the conſiſtence of honey; after which in drying it ſmelt like ſalt of tartar, and emitted a ſtrong urinous ſmell. —When dry, the reſiduum only weighed forty-five grains; it run a little per deliquium, and had the taſte of ſal ammoniac mixed with ſea ſalt, and withal a great bitterneſs; put on the burning coals it emitted a ſmell of burnt wool; one part melted quickly, the other turned black, ſwelled, and remained in form of a cruſt; oil of vitriol acted much more powerfully on this, than on the other matters; for it made a ſtrong ebullition, raiſed fumes of ſpirit of ſea ſalt, and on the mixture being expoſed to the air it attracted a great deal of moiſture, and after ſome time there were found chryſtals of Glauber ſalt in the liquor.

The three reſidua, mixed with oil of vitriol, contained of earth ſoluble in this menſtruum in the proportion of three, ſix, ten; and a pound of the waters contains of fixed matter, ſoluble in the vitriolic acid, one and two thirds of a grain, which Dr. *Le Monier* believes to be the baſis of ſea ſalt.

The reſidua, calcined, yielded no particles which were attracted by the loadſtone.

From this account of Dr. *Le Monier*'s, this water ſhould ſeem to be impregnated with a bitumenous matter, or ſea ſalt, and an earth; and that the quantity of ſediment obtained by evaporation is but ſmall; though we cannot determine the exact proportion, as he has not mentioned the weight of the two quantities of precipitate which he ſeparated from the water in the time of the evaporation.

Monſ. *De Secondat*, in a *Memoir* read in the *Academy* at Bourdeaux, in the year 1747, gives the following account of them.

There are a number of ſprings which ſupply five baths.

The bath of the entrance (de l'entrée) receives its waters by two canals of different degrees of heat, the one raiſes the mercury in Fahrenheit's thermometer to ninety-five, the other to one hundred and eleven.

The royal bath is likewiſe ſupplied by two ſprings, the one of which raiſes the thermometer to one hundred and twelve, the other to one hundred and thirteen.

The bath at the bottom receives ſome waters which raiſe the thermometer to one hundred, and others which raiſe it one hundred and ten and a half.

The heat of the polar bath raiſes it to ninety-nine, and that of the chapel bath to ninety.

Theſe waters of Barege are very clear and tranſparent, and are principally remarkable for their ſmell, which is commonly compared to that of boiled eggs, for giving ſilver a black colour, and for their unctuous feel, which is ſo remarkable as to make thoſe who uſe the baths compare theſe waters to oil.

Weighed in a hydroſtatical balance, they had the ſame ſpecific gravity as the water of the river Baſtan in the neighbourhood.

Five pounds and a half of the water of the royal bath were diſtilled in a glaſs curcurbit, with a conſtant but ſuch a ſlow fire, that it was full fourteen days before the operation was finiſhed. The water which came over into the receiver was examined the third day, and it differed in nothing from diſtilled common water; and what remained in the curcurbit retained in a ſmall degree the ſmell of boiled eggs, and the property of tarniſhing ſilver. —And at the end of the fourteen days, when the water was all evaporated, there remained only twelve grains of a ſaline matter which had a ſharpiſh taſte, fermented with ſpirit of nitre, and turned ſyrup of violets of a green colour, which indicates an alcaline quality.—The water, which had come over into the receiver, differed in nothing in the ſmell or taſte from common water, which had ſuffered ſo long the action of the fire.

In the crevices of the vaults of the baths and conduits, there gathers a white ſaline efflorescence, which on trial proves to be ſea ſalt.

The inſides of the conduits of theſe waters is covered with a fine ſoft mucilaginous matter, which they call the mud or ſlime of the baths, and which is thought to be a very reſolving and emollient ſubſtance. It has the conſiſtence, taſte, and ſmell of tallow, it melts with heat, and flames when thrown on the fire; and there are few ſubſtances ſo volatile as it, camphor not excepted.—A quantity of it, collected and put between two folds of paper, was ſoon reduced to a very fine pellicle, which had loſt its inflammable property, and only ſpread a ſmell of burnt fat when thrown on the fire.

Du Clos tells us, that when this water was brought to Paris, three weeks after being taken up, it taſted of the mud of a bog or moraſs; that in evaporating, it threw up a pellicle, and flocculi were obſerved floating through it, and it dropt a ſmall portion of a ſediment, and yielded of ſolid matter only one four thouſand and ſeven hundredth part, which is only a little above thirteen grains from the gallon, ſome of which was ſea ſalt.

Dr. *Rutty*, who evaporated this water after it was brought to Dublin, ſays, he obtained about ſeventeen grains of ſolid contents from the gallon, which had the appearance of a light-grey powder intermixed with ſhining particles; the taſte was partly ſaline, and partly lixivious; it fermented greatly with oil of vitriol, turned of a bright green with ſyrup of violets, and ſmelt pungent when rubbed with ſal amoniac; it moiſtened in the air, ſparkled on the red hot iron, and a great part of it fled away.

The Doctor concludes, that the chief minerals impregnating theſe waters are bitumen and ſulphur, with a ſmall quantity of natron, a little marine ſalt, ſome abſorbent earth, and probably ſome ſelenites.

Sir *Chriſtopher Meighan*, in the year 1764, publiſhed a ſecond edition of his treatiſe on theſe waters, in which he gives the following account of them.

He ſays, there are four baths which were built by an architect of the king of France, to wit, 1ſt The great bath *(Le Bain grand)*. 2d. The little bath *(le Petit Bain)*. 3d. The new bath *(le Bain Neuf)*. 4th. And the pleaſant bath *(le Bain de Delices)* [a].

There is always a ſmoke or vapour ariſing from theſe waters, which is more or leſs perceptible at different times, according to the changes of heat and cold in the air.

The waters are always perfectly limpid and clear, and a very fine pellucid oil is to be obſerved on their ſurface as they ariſe freſh from their ſprings, but this vaniſhes in a very ſhort time.

The heat of the waters in the different baths raiſed the quickſilver in Fahrenheit's thermometer to the following heights:

In the great bath *(Le Bain grand)* to	—	—	111¼
In the little bath *(Le Petit Bain)* to	—	—	110
In the new bath *(Bain Neuf)* to —	—	—	109½
In the pleaſant bath *(Bain de Delices)* to	—	—	94¼

They have a taſte and ſmell which indicates them to be truly bitumenous, and they impreſs on the palate a ſmooth ſweetiſh taſte, not unlike that of a ſlight ſolution of manna in water, without its maukiſh quality; this flavour is more perceptible in the waters of the tepid than of the hot ſprings; and as it is owing to a very fine æthereal oil and volatile ſalt which very ſoon exhale, they loſe it ſoon in part; for after they have ſtood for about half a minute, they become in ſome meaſure flat, diſagreeable, and harſh; and by ſtanding long they loſe their bitumenous taſte and ſmell, and their great limpidity and unctuous quality, and they become ſpecifically heavier.

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[a] It is a pity that authors did not always give the ſame name to the ſame bath, for the not doing ſo is apt to create miſtakes.

Their unctuous quality is quite palpable, for they ſlip between the fingers like oil, and the body immerſed in them feels as if it had been rubbed over with a fine pomatum or cold cream.

The ſediment or matter which theſe waters depoſit is a greaſe-like ſubſtance, connected with ſmall filaments, and is conſtantly found where-ever they glide, or ſtagnate in their pipes, in their conduits, and in their baths. It is perfectly unctuous, and bears a reſemblance to the ſoft ſoap commonly uſed in England.

The mineral and vegetable acids, the fixed and volatile alkaline ſalts, ſyrup of violets, heliotropium, galls, infuſions of tea, oak leaves, pale roſes, and milk, mixed ſucceſſively with different parcels of theſe waters taken up recently from the fountain, produced no other change than when mixed with common water; and blue paper immerſed in them underwent no change of colour.

He tells us, that a quart of the freſh thermal water, put on the fire at the ſame time with cold water, was a minute later of coming to the boil; this experiment has been ſaid to hold good with many other thermal waters which have been put to the ſame teſt; but as ſeveral late authors, who have repeated this experiment, tells us, that that the fact is not ſo, it is to be wiſhed that this experiment was repeated with care, that the truth might be aſcertained.

Some of the natural ſediment of theſe waters, ſpread on paper, exhaled for the moſt part in a few hours, and the little which remained was a filamentous ſcum, which ſtuck very faſt to the paper, and being burnt emitted a ſtrong bitumenous ſcent.

Two quarts of the waters were evaporated in an earthen pan, with a ſlow even fire; the pellicle was ſcarce perceptible; but as the operation advanced, the ſides of the veſſel became ſlightly marked with a grey ſcurf. When the liquor was reduced to about four ſpoonfuls, it was of a brown yellow colour, and extremely unctuous. It had a mixed taſte, partly ſaline, partly oily, and ſomewhat ſweetiſh. After a perfect evaporation, the bottom of the pan remained thinly incruſted with the ſame ſort of matter as on the ſides, but darker in colour, very acrid, and hot on the tongue, like wormwood or other lixivial ſalts. It weighed only one four thouſand and ſeven hundredth part of the whole, which is in the proportion of a little above thirteen grains (or thirteen grains and one thirteenth) of ſediment from the gallon: the reſiduum efferveſced with acids, but neither the fixed nor the volatile alkali affected it.

From this account it is evident that theſe waters contain but very little ſolid matter, and that in their natural ſtate they give no marks of a chalybeate impregnation, and that their ſalts are perfectly neutral, though, when heat is uſed in evaporating them, the fine acid of the neutral ſalt flies off, and leaves only the alkaline baſis behind. —And that as they riſe from their ſprings they are impregnated with an extreme volatile bitumenous matter, and a fine mineral ſpirit, both of which ſoon evaporate when they are expoſed to the air; which ſhews the perfect refinement of their principles, and the neceſſity there is of uſing them at the fountain head, in order to benefit by thoſe precious particles, whoſe eſcape is not to be reſtrained by any means whatever.

Theſe waters paſs off by perſpiration and urine, and they ſeldom or never purge unleſs they be poured down ſo abundantly as to precipitate themſelves.——He ſays, the people who drink them, and bathe in them, make no complaint of being overheated, but enjoy an eaſy flow of ſpirits, and a conſtant moiſture which renders their linen remarkably greaſy, and exhales from their bodies even for ſome time after quitting them.

Before a patient begins to uſe them, it is requiſite that he reſt for a day or two after his journey to Barege, and that he let blood, if there be any inordinate emotion or repletion in the veſſels, and a vomit or purge is often indicated in the beginning, to clear the firſt paſſages.

Clyſters of the thermal waters are among the beſt remedies for relieving coſtiveneſs.

In wounds and ulcers from external cauſes, the hot douches, only with ſome previous baths, anſwer all purpoſes; but if there be any marks of internal depravation, it is then material either to drink the waters pure, or with milk.—While a part is tender, the application of the douche muſt be gentle; and in caſe of inflammation it muſt be ſuſpended, and fomentations of the water, with temperate baths, be uſed in their place.

The proper time for dreſſing wounds is immediately after the douche; and no other applications are uſed than pledgets dipped in the thermal water, and the water is often injected into fiſtulous ſores.

The douche may be uſed morning and evening for ten or fifteen minutes.

When wounds begin to heal, the douches ought to be laid aſide, and dry lint only employed for dreſſing them.

In caſes where both baths and douches are requiſite, the former ſhould precede, in order to diſpoſe the parts to receive more efficaciouſly the influence of the latter; I mean temperate baths, for the hotteſt ſhould only be employed in phlegmatic conſtitutions, and in diſtempers attending them.

To cure indurated tumors, the temperate baths is the eſſential agent, and is to be uſed as much as poſſible; and when the douche is thought proper, care muſt be taken not to irritate or inflame the ſurrounding parts.

In rheumatiſms and other diſeaſes from imperfect perſpiration, temperate baths ſhould precede the douche; and for obſtructions in the bowels, drinking the waters, and temperate baths and gentle douches on the part affected, are of ſervcie.

Neither baths nor douches are to be taken till four, five, or ſix hours after meals.

The ordinary duration of the temperate bath is one hour; but it may with ſafety be extended to any ſpace deſired, and is frequently better if continued for two hours or more..

After baths as well as douches, it is beſt for the patient to go to bed for the benefit of perſpiration, and during this evacuation no drink is fitter than the bath waters.

The proper time for drinking theſe mineral waters is in the morning; and the quantity drank may be from a bottle to three pints.

A glaſs drank after dinner helps to perfect the digeſtion.

Dr. *Le Monier (Mem.* 1747.) ſays, that the waters of Barege, though diſagreeable to the taſte, ſit light on the ſtomach; that they do not purge, but paſs eaſily off by urine and perſpiration.

They have been recommended in variety of diſorders, for which warm ſulphureous baths have been uſed; in rheumatiſms, palſies, convulſions, cutaneous eruptions, &c. They have been particularly recommended for the cure of old gunſhot wounds, and other inveterate ſores, though of late their particular efficacy in ſuch caſes has been much doubted.

In the 6th vol. of *Med. Eſſays*, edit. 4. p. 466. we are told, that Mr. *de la Peyronie* remarks, that the hard knots which form ſometimes in the corpus cavernoſum urethræ after venereal complaints, and are very difficult to cure, have been reſolved by douches of the waters of Bareges, after mercury had been freely uſed without any effect.

ITALIAN WATERS.

PADUA.

There are a number of hot waters in the country of Padua, of which Dr. *J. Gratian Bergomenſi* gives an account in the *Acta Lipſiæ* for the year 1702, page 1. and which we find publiſhed in the additions, or the eight book added to *Baccius de Thermis.*

He ſays, there are ſeven ſprings which have all a ſulphureous ſmell.—1ſt. The firſt is the bath at *Aponum*, ſituated five miles from the town, which is very hot. 2d. A mile from which is St. *Peter*'s, the bottom of which appears to be of different colours. 3d. About 500 paces from this is the bath of the *New Houſe*, near to which a quantity of ſalt uſed to be prepared. 4th. Two miles from thence is the bath of *Mount Grotti.*

Grotti. 5th. Seven miles from Padua is the bath at the *Church of St. Helen*, the ſpring of which riſes from the top of the hill; and its water is ſo hot, that it cannot be touched without a ſenſe of pain. 6th. Twelve miles from Padua is the bath of St. *Bartholemew*, which is full of a thick fattiſh mud. 7th. The bath at *Mount Ortho*, the water of which is very hot, though there is near to this a tepid bath, which goes by the name of the bleſſed *Virgin*'s *Bath*.

In this account of theſe waters we are told, that Dr. *Bergomenſi* concludes, from experiments, that they are all of the ſame kind, and contain a fine acidulous ſpirit, ſulphur, a ſalt approaching to the nature of ſea ſalt, and a portion of earth; and he calls them ſulphureo-ſaline waters, which differ only in the ſtrength of their impregnation.

BATH AT APONUM.

This account of Dr. *Bergomenſi* agrees in a great meaſure with that given by *Fallopius* [a] of the water of the bath at *Aponum*; as it riſes from the ſpring, he ſays, it is impregnated with three different ſubſtances. 1ſt. With ſea ſalt. 2d. With a calcareous earth. 3d. With a ſulphureous vapour.

The ſea ſalt is the moſt predominant, and is got in large quantity by evaporation; the calcareous earth concretes to the ſides of the baths, and is likewiſe got by evaporating the water; the ſulphureous vapour is ſtrong, as the water riſes from its ſpring; but flies off when the water is kept or evaporated, and no actual ſulphur is ever found among the ſolid contents obtained by evaporation; though if the ſulphureous vapours of theſe waters be confined in their channels, eſpecially in the winter ſeaſon, they concrete into a genuine ſulphur, manifeſt by the taſte, ſmell, and other properties.

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[a] *Vide Gabriel. Fallopii, Mutineſio, M. D. Tractatus de medicatis aquis, &c. Venetiis* 1564, *fol.* 70.

This account of *Fallopius*, with reſpect to the ſulphur vapour, agrees with what Dr. *Lucas* has ſince obſerved of the Aix la Chapelle (or Aken) water.

In the *Philoſophical Tranſactions*, N°. 83. Mr. *Doddington* tells us, that the baths at Aponum are very hot and ſtinking, and that they yield a great quantity of very fine ſalt, which the natives gather by putting pieces of wood into the water, to which it adheres in form of flakes, exceeding white, and very ſalt; he ſays, the natives waſh the walls of their houſes with the waters of the bath, which only preſerve the ſaltneſs for ſome few days, and then become inſipid, even though they ſweat forth a white excreſcence compoſed of thin and light flakes like nitre for many years after.

Theſe waters drank from a half to two, three, or more pints, are purgative and diuretic.

They are uſed both as baths and for drinking; and for the ſame purpoſes as other ſaline ſulphureous waters.

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MOUNT ORTHO.

About 150 paces from the bath at *Aponum* is *Mount Ortho*, at the bottom of which is a chapel dedicated to the *Virgin Mary*.

In the veſtible of this chapel is a ſpring of cold water fit for drinking, and oppoſite to this is a ſpring of tepid water, which taſtes a little ſalt.

Beyond the chapel is a monaſtery of St. *Auguſtine Monks*, on the eaſt ſide of which is a ſpring of very hot water of the ſame kind as the water of the Aponum bath, but neither ſo ſalt, nor ſo ſulphureous.

This water is alledged to contain a bitumen, or foſſil oil, but none of this appears as it riſes from the ſpring; ſomewhat indeed of an oily matter gathers on its ſurface, after it has ſtood in pools, in the neighbourhood, till it putrefies; but this is common to moſt waters.

The water of this ſpring runs into a bath, near to which are two vapour baths, or places filled with the warm vapours, which are excellent for ſoftening and relaxing rigid joints.

In the crevices through which the water comes out of the earth, is an argillaceous fat, ſoft clay or mud, which is eſteemed for the cure of hard œdematous ſwellings; but it is difficult to gather it.

ST. PETER's BATH.

Two miles from Mount Ortho is a hill, on one ſide of which is a houſe called St. *Peter*'s, where there is a bath which is ſupplied with a very hot water, which, Dr. *Fallopius* ſays, is not ſo ſalt as that of the bath at Aponum; and it contains a tophaceous and argillaceous matter, and ſeems to be very little, if at all impregnated with a ſulphureous vapour.

On the other ſide of the hill are a great many ſprings of water, of different degrees of heat.

There is here likewiſe a clay, or mud, that is uſed in the ſame manner as that of the other baths.

The Doctor complains, that the vallies, below this bath, are covered with ſtagnating water which becomes putrid; but might eaſily be carried off, if proper drains were made.

The

The BATH of the NEW HOUSE.

Four miles eaſt of St. *Peter*'s Hill are the baths *of the New Houſe*, called ſo from a houſe built there for making ſalt, by the family of the *Carrarii*, who formerly governed that country.

There are different ſprings here which yield a very ſulphureous, hot, and ſalt water; but the badneſs of the road to them has brought them into diſuſe.

The BATH of MOUNT GROTTO.

About half a mile to the ſouth of the bath *of the New Houſe* is the warm bath of Mount Grotto, or Ægrotto, the water of which is not near ſo ſalt as that of the Aponum bath.

It is impregnated with a gypſeous, inſtead of a calcareous earth, and has a ſtrong ſulphureous ſmell, being ſtrongly impregnated with a ſulphureous vapour.

BATH of ST. BARTHOLOMEW.

About two miles ſouth of St. *Peter*'s bath is that of St. *Bartholomew*.

Before the houſe is a fountain of ſweet cold water which runs into a bath, where it very ſoon becomes ſo hot that one cannot hold their hands in it; the bottom of this bath, and all the ſtones in the neighbourhood, being heated by ſubterraneous fire.

There is here a mud or clay gathered from theſe heated ſtones, that is impregnated with a bitumenous vapour, which is eſteemed a good remedy for the cure of ſprains, ſtiff joints, &c.

BATH of St. Helen.

About two miles from the bath of St. *Bartholomew*, and eight from *Padua*, is the bath of St. *Helen*. Here there are ſeveral fountains of very warm water; a covered bath; vapour baths, and a mud or clay.

The water has a very mild, ſalt taſte; being not near ſo ſalt as that of the Aponum bath.

The ſediment has an argillaceous, or ſomewhat of an ochreous colour, and is ſomewhat aſtringent.

The water itſelf is ſtrongly impregnated with a ſulphureous vapour.

In the year 1761, Dr. *Dominicus Vandellius* publiſhed a more particular account of the hot mineral waters of Padua; he ſays, there is a great number of hot ſprings every where in this country; but that there are only eight which are uſed at preſent for the cure of diſeaſes, viz.

1ſt. The *hot* water of *Aponum.*
2d. The *tepid* water of *Aponum.*
3d. The water of *Mount Ortho.*
4th. The water of the *Virgin.*
5th. The water of St. *Peter.*
6th. The water of *Mount Ægroto.*
7th. The water of St. *Bartholomew.*
8th. The water of St. *Helen.*

For there is now no veſtiges of the houſe or baths, called, *of the New Houſe.*

The waters of all theſe ſprings are nearly of the ſame nature, and therefore he treats principally of thoſe of Aponum, and occaſionally mentions any thing that is particular in the others.

They are all ſo extremely limpid, that a piece of money can be ſeen at the bottom of the baths: and if they be kept in well ſtopt bottles, they remain always limpid, and depoſit no ſediment, nor have any pellicle come on their ſurface; but if the waters ſtand long in the baths, there gathers a top a pellicle, which when it becomes thick adheres to the ſides, or falls to the bottom of the baths.—In ſome places this pellicle appears unctuous, and variegated like a rainbow; the firſt of theſe pellicles ſeems to be moſtly compoſed of a true ſelenitical ſalt, with a ſmall quantity of earth; the other to have likewiſe the mixture of an oily matter.

As they riſe from their ſprings they have a ſtrong ſulphureous ſmell, which is ſomewhat volatile and penetrating, particularly that of the hot water of Aponum; but after they have cooled for ſome time, they loſe entirely their ſulphureous ſmell, unleſs they be ſhaked in a phial, or heated over the fire; and if they be kept for a month in a bottle, where there has been wine, they acquire a ſmell of hepar ſulphuris. Their taſte is ſalt and ſulphureous, and ſeems to be ſomewhat milky, though they diſcover nothing unctuous, unleſs they have ſtood long.

They are of different temperatures; for being tried with one of Monſ. *Reaumeur*'s thermometers, in which the heat of boiling water raiſed the quickſilver to eighty degrees,

grees, it ſtood at the following heights in the different waters.

	Reaumeur's.		Fahrenheit's.
In the hot water of *Aponum*	63	which is equal to	$173\frac{3}{4}$
——tepid water of *Aponum*	$25\frac{1}{4}$	——	$88\frac{3}{4}$
——water of *Mount Ortho*	$49\frac{1}{2}$	——	$143\frac{3}{8}$
——water of St. *Peter*	$55\frac{1}{5}$	——	$157\frac{1}{5}$
——water of the *Virgin*	18	——	$72\frac{1}{2}$
——water of *Mount Ægroto*	$53\frac{1}{2}$	——	$152\frac{3}{8}$
——water of St. *Bartholomew*	$39\frac{1}{3}$	——	$116\frac{1}{3}$
——water of St. *Helen*	$51\frac{1}{3}$	——	$115\frac{2}{3}$

They are heavier than diſtilled rain water, made of the ſame degree of heat; for a ſolid body which loſt 937 grains when weighed in rain water, and 930 grains in diſtilled water, loſt

			grains.
In the hot water of *Aponum*	——	——	950
——tepid water of *Aponum*	——	——	952
——water of the *Virgin*	——	——	951
——of *Mount Ortho*	——	——	$948\frac{1}{2}$
——of St. *Peter*	——	——	948
——of *Mount Ægroto*	——	——	949
——of St. *Bartholomew*	——	——	$948\frac{1}{2}$
——of St. *Helen*	——	——	951

Beſides the pellicles which gather on the ſurface of theſe baths, and afterwards precipitate to the bottom, theſe waters likewiſe drop a fine brown yellowiſh earth, like to an ochre, when they ſtand long in the open air, after they are cool; which on examination is found to be an irony ſand, mixed with a number of yellow bodies; this he calls *Mica flava ſeu Animochryſo.*

In order to aſcertain that this yellowiſh earthy ſediment owed its colour to iron, he boiled a parcel of it in diſtilled water, and it gave the water a dark brown colour, which changed to a tranſparent dark red, and then to a black, on the addition of a decoction of galls. He calcined another parcel in a crucible, and applied a loadſtone, which attracted a number of particles from it; and laſtly, he rubbed part of this ſediment with ſome flowers of ſal amoniac, and then ſublimed them in a glaſs veſſel, and obtained true Flores Martis.

On the inſide of the arches of the conduits are found a number of fine brown cruſts, which if ſcraped off, and a loadſtone immediately applied, are attracted by it; from whence he concludes them to be iron, and to have been ſublimed by the waters; and he ſays, he doubts much whether ſuch lamellæ of iron can be prepared artificially by ſublimation. Theſe cruſts frequently drop from the vaults or arches of the conduits,

duits, and are found mixed with the ſediment in the bottom of the waters. And there is likewiſe found on the inſide of the arches of the conduits, and of the covers of the *Aponum* waters, and in the crevices between the tophaceous concretions which are formed by the waters, a chryſtallized ſulphur and flowers of ſulphur. He ſeems to think that where the vitriolic acid and a phlogiſton meet pure and without any mixture, that they there form the pure flowers of ſulphur; but if theſe principles be united with a peculiar ſort of earth, or a ſelenitical ſalt, they then form what he calls chryſtals of ſulphur. He ſays, that the chryſtallized ſulphur, found in the Aponine conduits, poſſeſſes all the qualities of true ſulphur, with this additional property, that if it is boiled in the thermal water, it again diſſolves, gives the water a yellow colour and a ſmell of ſulphur, which remains long, even after the water cools; but by degrees the water loſes its yellow colour, and all the particles of ſulphur are precipitated to the bottom, though the water ſtill retains a little ſmell and taſte of ſulphur. Dr. *Vandellius* ſeems to doubt whether any ſuch chryſtals of ſulphur can be prepared by art; for he has never heard of any chymiſt who was able to make them.

A quantity of ſea ſalt concretes, at certain ſeaſons, to the ſides of the fountains and rivulets of theſe waters, near to their ſprings, which if gathered immediately retains all the properties of ſea ſalt; but if it be left long expoſed to the heat of the ſun, and of the waters, it becomes an inſipid white earth, which by degrees is turned into ſtone.

In the bottom, and at the ſides and conduits and ſtreams of theſe waters, numbers of tophaceous concretions of different ſorts are formed; ſome are hard and firm, and take a poliſh almoſt like marble, while others are more ſoft, friable, and ſpongy. Some are almoſt entirely made up of chryſtals of ſelenite, which he calls ſelenitical tophuſes; others are formed by a mixture of all the different ſorts of ſolid matters precipitated by the waters; for by a chymical analyſis he proves that they contain earth, ſelenite, ſea ſalt, ſulphur, iron, and a lixivial ſalt; theſe he calls calcareous tophuſes. Every thing thrown into the

Aponum waters is ſoon covered with a tophaceous concretion; and ſuch concretions are preſerved in the cabinets of the curious; and hence they have been ranked among the petrifying waters. In the ſpace of four or five years, they ſo cover the inſide of the wooden canal that conveys them to a mill, and likewiſe the wheel of the mill, that they are obliged to ſcrape it off; when it is found to be compoſed of ten or more aſh-coloured lamellæ, of about two lines thickneſs.

In the channels of theſe waters is found likewiſe a glutinó-mucous, aſh-coloured, unctuous matter, which when not quite dry is eaſily diſſolved, and burns for a little while in the fire; but if it be well dried, and then thrown on the fire, it gives only a heavy ſmell like burnt fat.

The mud or lutum, which is gathered from the bottom of ſome of the baths, he ſays, is only ſome of the ſame ſort of earth as is found in the valleys in the neighbourhood, which has been well wetted and ſoaked in the water.

Theſe waters are plentifully impregnated with a mineral aerial ſpirit, and with a penetrating ſulphureous vapour. When taken up freſh they ſparkle, and throw up a number of air bubbles; when an oblong phial with a ſmall neck was half filled with them, and well ſhaked, while a thumb was held on the mouth of the bottle, they fermented ſtrongly; and when the thumb was removed they burſt out with a noiſe, and roſe full two Paris feet above the mouth of the phial. After the fermentation had ceaſed they were ſhaked a ſecond time, and the ſame thing happened; but the third time the exploſion was leſs; and the fourth time it could not be perceived; though after letting them ſtand for ſome time, or on adding a little diſtilled vinegar, they ſtill gave marks of a mineral aerial ſpirit.

Though theſe waters let drop an iron-ochrey ſediment, to the bottom of their baſons, yet they gave no colour to linen dipt into them, nor did they ſtrike any ſhade of a red, purple, or black on the addition of a clear tincture of galls; they only made the water turbid; and after they had ſtood ſome hours, there appeared on their ſurface a thin ſcum, or an oily-like variegated pellicle, of the colour of a rainbow.

When mixed with ſyrup of violets, they changed its colour, a little, to a green; and when mixed with tincture of heliotropium they became red like Rheniſh wine; but after the waters had ſtood for ſome hours till they were cool, they ſcarce produced any change of colour on the tincture; which ſhews the preſence of a vitriolic acid; thrown on blue paper they did not ſtain it.

A ſilver cup, put into the hot waters of *Aponum*, turns of a black blueiſh colour in a few minutes, but not in the waters of the other baths; though their mud or lutum changes the colour of ſilver, eſpecially the mud of the water of St. *Bartholomew*.

None of the mineral acids cauſed any remarkable fermentation, or other change on the freſh waters.

Alcaline ſalts made them milky, and ſaccharum ſaturni turned them likewiſe white, and precipitated a white earthy ſediment.

A ſolution of mercury in ſpirit of nitre, dropt into the waters, occaſioned a milkineſs and precipitation, which appeared in form of a white coagulum; and being ſeparated and dried became of a dark blueiſh colour.

When a quantity of diſtilled water, made warm, was thrown into the thermal water, mixed with the ſolution of mercury in ſpirit of nitre, it became immediately yellow, which ſhewed a mixture of the vitriolic acid; and part of the precipitate remained of a dark brown yellow, which ſhewed a mixture of a calcareous earth.

Borax, lime water, green vitriol, and ſublimate mercury, produced no change of colour in the waters; but a ſolution of alum made them white.

Mixed with the human blood, immediately after it was drawn from a vein, in the proportion of one tenth part of blood, they prevented its coagulating, and rendered it of a bright red and not thick.

A piece of red cloth, put above theſe waters when ſet over a fire, changed a little its colour, which he ſays is mark of a vitriolic acid exhaling from the waters.

Seven pounds of the waters of each of theſe fountains being put into eight open mouthed glaſſes, were ſet on a furnace, the heat of which was below that of boiling water, and evaporated in a *Balneum Mariæ*.

After ſome time all the waters became turbid, and a number of corpuſcles, the chryſtals of a ſelenitical ſalt, were obſerved floating in the water, and by degrees formed a pellicle on the ſurface, which after ſome time ſubſided to the bottom, and was alternately ſucceeded by others till the waters were reduced to one fortieth part of their original quantity; when, inſtead of a ſelenite, chryſtals of ſea ſalt began to appear on the ſurface, and continued forming till the waters were almoſt entirely exhaled; and there remained an *aqua mater*, or a lixivium of a yellow acrid, bitter, ſalt taſte, like to ley or aqua mater of ſea ſalt; and when dried it yielded a ſea ſalt that attracts moiſture from the air.—If this reſiduum be left moiſt, it has an orange colour; but if it be kept on the fire till it be quite dry it becomes white.

The quantity of ſediment left by the ſeven pounds of each of the waters, after evaporation, was as follows;

		dram.		ſcr.		gr.
1. By the hot water of *Aponum*	—	4	—			6
2. By the tepid water of *Aponum*	—	3	—			17

	dram.	ſcr.	gr.
3. By the water of *Mount Ortho* —	2	—	17
4. ——— of the *Virgin* — —	2	2	5
5. ——— of St. *Peter* — —	3	1	3
6. ——— of *Mount Ægroto* —	3	—	14
7. ——— of St. *Bartholomew* —	2	2	—
8. ——— of St. *Helen* — —	4	—	15

Seven pounds of each of the waters were next diſtilled in glaſs veſſels. The diſtilled water ſhewed marks of a vitriolic acid, by its changing the colour of the tincture of heliotropium to a red ; and by a piece of red cloth, which had been hung in the top of the curcurbit, having changed its colour.

The firſt water which came over diſcovered itſelf to be impregnated with a ſulphureous vapour, by its ſmell and taſte.— Both the diſtilled water, and the curcurbit in which it was diſtilled, acquired an empyreumatic ſmell, or a ſmell of burnt fat, which indicated the exiſtence of a mineral oil in the water.

During the diſtillation the waters exhibited the ſame appearances, and yielded nearly the ſame quantity of ſolid contents as when they were evaporated in open veſſels, though the quantity varied ſometimes a little. The following is a table of the quantity of ſolid contents obtained by diſtilling ſeven pounds of each of the waters, and of the ſalts and earth obtained from each.

The hot waters yielded of ſolid contents,				cub. Salt.			ſelen		earth	
	dr.	ſcr.	gr.	dr.	ſ.	gr.	ſ.	gr.	ſ.	gr.
1. The hot water of *Aponum*	4	—	15	3	—	—	2	—	1	15
2. The tepid water of *Aponum*	3	—	27	2½	—	—	1	—	1	17
3. The water of *Mount Ortho*	2	—	13	1½	—	—	1	4	1	3
4. — of the *Virgin* —	2	2	5	2	—	—	1	—	1	5
5. — of St. *Peter* —	3	—	23	2½	—	—	1	8	1	5
6. — of *Mount Ægroto*	3	—	14	2	1	—	1	5	1	9
7. — of St. *Bartholomew*	2	2	—	2	—	—	1	—	1	—
8. — of St. *Helen* —	4	—	—	2	—	46	--	34	2	—

He made ſeveral experiments with the waters and their ſediments left after evaporation, to try if they contained Glauber, or any other true neutral ſalt beſides ſea ſalt, but he could diſcover no marks of any.

From all theſe experiments Dr. *Vandellius* concludes, that theſe waters are impregnated with, 1ſt. *A mineral aerial ſpirit.* 2d. A *vitriolic acid.* 3d. A *neutral ſalt*, which gives every mark of *ſea ſalt*. 4th. An *alcaline earth*, which, united with the vitriolic acid, forms a ſelenite. 5th. A *mineral oil*. 6th. *An earth*, which, he ſays, belongs to the claſs called *agaric mineral*, or *Lac Lunæ*. 7th. Some particles of *iron*;

for although they did not ſtrike a purple or red with a decoction of galls, but only became turbid, yet the other experiments, mentioned to have been made with the ochreous ſediment, evidently prove them to be chalybeats; and Mr. *Geoffroy*, in his account of the experiments made with the waters of Paſſy in France, has ſhewn that we cannot always be certain that waters contain no iron, becauſe they do not ſtrike a purple or red with galls. 8th. The ſmell of the waters of Aponum, their changing the colour of ſilver, and the ſulphur which is found on the inſide of the arches of the baths, and in the crevices of the conduits, and of the tophaceous concretions, all ſhew that theſe waters deſerve the name of ſulphureous; but he doubts whether they contain any real or true ſolution of ſulphur, and rather thinks that they only contain its principles, a phlogiſton, and the vitriolic acid, which being ſublimed by the heat of the waters, meet on the inſide of the vaults, and in the crevices, and there unite to form a ſulphur; in the ſame manner as Dr. *Lucas* has alledged, that the ſulphur is generated by the waters of Aix la Chapelle.

He recommends theſe waters for the ſame purpoſes as *Fallopius*, and in other caſes likewiſe; and to be drank from three to ſeven or eight pints.

GERMAN WATERS.

BADEN BADEN.

The town of Baden Baden, called *Thermæ Hercyniæ*, ſituated in the marquiſate of the ſame name, in the circle of Swabia, has antiently got its name from the multitude of hot baths about it, which are ſaid to amount to near three hundred [b].

In the year 1608, Dr. *Johannes Matthæus* of Heſſe publiſhed the ſecond edition of his deſcription of theſe warm baths and ſprings; in which we are told, that there are twelve ſprings in this place, which ſupply a vaſt number of baths, and that the waters are all nearly of the ſame nature, and only differ in their degree of heat.

1ſt. The principal ſpring is a very plentiful one, and riſes up in the market-place, in the broad way as you go to the Gryphon inn, in the middle of the hill on the ſouth ſide; it is encloſed with a wall, and cloſe at top, all except one opening which is left to let out the vapour; but is ſo covered as to prevent the rain and ſnow from falling into the baſon.

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[b] See *Salmon's Modern Hiſtory*, 4to. edit. vol. 2d. p. 109.

2d. The ſecond is ſituated in an obſcure place in the ſame ſtreet, and near the ſame inn. It is dedicated moſtly to culinary purpoſes, for ſcalding hogs and fowls to bring off the hair and feathers; and from thence it has been called the *Scalding Fountain* (Scaturigo depilans). The water of this ſpring is the hotteſt of any in this place.

3d. The third is in the Gryphon inn, on the left hand in entering.

4th. The fourth is below the Scalding Spring, almoſt under the great gate of the Gryphon, and is ſurrounded by a wall. Its water is conveyed by a large pipe or ſpout to the *Ungemach* inn, and goes by its name.

5th. The fifth is ſituated on the higher part of the hill, beyond the Scalding fountain, in a very obſcure place, and has been called the *Infernal.*

6th. The ſixth in the *Ungemach* inn.

7th. The ſeventh at the eaſt corner of the ſame inn, in a place called by the inhabitants the *Fat Cave*, and from thence it has been called the *Fat Spring.*

The

The 8th, 9th, and 10th all riſe at an inn, which has got its name from a cold fountain. The 8th and 9th are hot, the 10th only tepid.

The 11th and 12th riſe by two different ſprings under the market-place for meat, in an oblong hollow. The one is hot as the other baths, and called the *Bitten*, or the *Bath of Prayer*; the other is tepid, and called the *Baldtreich*.

All theſe waters are very limpid, have a ſaltiſh taſte and a ſulphureous ſmell; and wherever they run conſtantly, in a ſmall channel, or through a ſmall crevice, there a pure ſalt is to be met with, and a ſtony calcareous matter is found adhering to the inſide of the channels or aqueducts which convey theſe waters to the different baths.

In evaporating them, Dr. *Matthæus* got two drachms of what he calls ſalt and alum, from half a meaſure (i. e. Lib. iſs.) of the water; but it ſhould ſeem from later experiments, that they contain no alum, and that he had miſtaken ſome other ſubſtance for it.

The ſtony concretions that adhere to the channels, if powdered, and thrown on the fire, firſt crackle, and then ſmoak, and emit a ſmell of ſulphur.

Theſe waters have been much uſed as baths in variety of complaints; and have likewiſe been drank as other mineral waters. The Doctor tells us, that thoſe who drink them ſhould begin with ſix or eight ounces in the day, and encreaſe the quantity by degrees to a pint and a half; that they generally purge mildly; and if they do not, that ſome mild opening medicine ought to be taken along with them; and that if they do not paſs off by ſtool, but make the patient ſick and uneaſy, they ought to be intermitted.

In the *Comment. de rebus geſtis in Medicin. & Philoſ. natural.* vol. i. p. 220. publiſhed at Leipſic 1756, we have an abſtract from a treatiſe on theſe waters, publiſhed by an anonymous author, at Frankfort in the year 1756, in which we have an account of an analyſis made of them, after they were brought to Frankfort.

They had a ſtrong ſulphureous ſmell like to that of a rotten egg. In evaporating a number of little bodies (flocculi) appeared floating in the water, and a gypſeous earth was precipitated to the bottom. Thirty ounces of the water yielded forty-three or forty-five grains of ſea ſalt, which is in the proportion of one hundred and eighty-three, or one hundred and ninety-two grains from the gallon. He affirms, that they contain no other ſolid matter but this ſalt, and the gypſeous earth already mentioned; and that there is no ſulphur, vitriol, alum, or Glauber ſalt to be diſcovered in them.

As this author did not examine theſe waters at the fountain, we cannot learn any more from his account than that they contain theſe groſs matters; and as he does not ſeem to be a very accurate chymiſt, and rather indulges too much in theory, we cannot entirely rely on the facts he has advanced, and therefore it is to be wiſhed that we had ſtill a more particular deſcription of them as they appear at their ſources, and a more accurate analyſis of them, before we can form a right judgment of their particular nature. But from the two accounts we have given, it is evident, that they are ſalt waters, which have a ſtrong ſulphureous ſmell, and contain either a gypſeous or a calcareous earth.

CHAP. IV.

OF HOT SULPHUREOUS WATERS CONTAINING A CALCAREOUS GLAUBER SALT.

IN treating of cold ſulphureous waters, we mentioned ſeveral which were purgative, and contained a calcareous Glauber ſalt; but I have not hitherto met with an accurate account of any hot water impregnated in the ſame manner; though it is probable, that many of thoſe called nitrous by *Baccius* will, on an accurate examination, be found to contain this ſalt.

Dr. *Rutty* mentions his having evaporated a water of this kind, a ſpecimen of which had been ſent from *Portugal* to *Dublin*; which is the

CALDAS.

The water of the baths at Caldas, in *Portugal*, when brought to *Dublin* had a fetid ſmell, like ſulphureous water; evaporated, a gallon yielded one hundred and ſeventy grains of a reddiſh coloured ſediment of a ſaline taſte, which on trial proved to be compoſed of marine ſalt and a calcareous Glauber.

CHAP. V.

OF HOT WATERS, WHICH HAVE A STRONG SULPHUREOUS SMELL; BUT WHICH HAVE NOT BEEN SO ACCURATELY EXAMINED AS TO KNOW THE NATURE OF THE PARTICULAR MATTERS WITH WHICH THEY ARE IMPREGNATED, OR WHICH CONTAIN BUT LITTLE SOLID MATTER.

THERE are a great number of waters which might be brought under this head; but we ſhall only mention a few of thoſe to be met with in *Flanders*, *Germany*, *Hungary*, *Switzerland*, *Italy*, and its *Iſlands*.

FLEMISH.

ST. AIMAND.

FRENCH.

D'AX EN FOIX.

GERMAN.

BOLL.
BADEN IN AUSTRIA.
MANNERSDORF.
LANDECK.

HUNGARIAN.

DOTIS.
BANKA.
BOINITZ.
STUBEN.
GLASS HITTEN.
EISENBACH.
BUDA.

SWITZ.

MOUNT ADDULA.
BADA.
BRIGENSIA.

ITALIAN.

VOLTERRANA.
STYGIAN.
PUTEOLI.
PETRIOLUM.
BAIA.
ASTRANUM.
CALLATURA.
BULLICANUM.
CAIÆ.
RAPOLUM.
SATURNIAN.
VINADUM.
ST. EUPHEMIA.
PICENTIA.
FRIULI.

CORSICA.

SARDINIA.

FLEMISH WATERS.

ST. AIMAND.

Monſ. *Morand*, in the *Memoirs of the Academy of Sciences for* 1743, gives the following account of the waters at St. *Aimand* in Flanders.

There is at this place two tepid fountains, the waters of which have a ſulphureous ſmell, and change the colour of white metals.

1ſt. The *Bouillon*, which riſes with great force, and makes a boiling noiſe; its water is ſweet in the mouth, and only leaves a little taſte of ſulphur; it tarniſhed ſilver put into it in a ſhort time; and it raiſed *Reaumeur*'s thermometer to fourteen and a half, which is equal to about ſixty-one of *Fahrenheit*'s.

It did not change the colour either of ſyrup of violets, or of tincture of tournſol; nor raiſed any fermentation with acids; but grew turbid and milky with oleum tartari per deliquium, and of a clear yellow with galls.

Lime water and a tincture of ſaccharum ſaturni underwent no greater change than if they had been mixed with common water; it loſt greatly of its ſulphureous ſmell in twenty-four hours; and it was quite gone at the end of five days.

Evaporated, eight pounds only yielded ſeventeen grains of ſediment in form of a fine powder, which was moſtly an inſipid earth, mixed with a ſmall portion of a gypſeous and ſaline matter, in which he ſays was diſcovered marks of the vitriolic acid.

2d. The other fountain, called the *Fountain of Arras*, has a ſtronger ſulphureous ſmell; it tinges white metals more readily, and its vapour tinges ſilver black. It raiſed *Reaumeur*'s thermometer half a degree higher than the fountain of the *Bouillon*.

Evaporated eight pounds yielded twenty-four grains, of the ſame ſort of reſiduum as that got from the *Bouillon.*

Hence we ſee, that this fountain is more ſulphureous and ſtronger than the other.

Mr. *Geoffroy*, who takes notice of theſe waters in *Philoſophical Tranſactions*, N° 347. gives much the ſame account with reſpect to the appearances on mixing different ſubſtances; but ſays, that he obtained ſeventy grains of reſiduum on evaporating five pints of the water, of which fifty-five grains were a grey earth, and fifteen grains a white ſalt, reſembling ſea ſalt.

Mr. *Morrand* tells us, that theſe waters have been eſteemed in the gravel, and in caſes where there was a ropy or ſlimy matter mixed with the urine.

Mr. *Geoffroy* ſays, that they have been eſteemed in nervous diſorders, in affections of the lungs; but as to their properties of purging, and removing obſtructions, they may have the ſame effect as common water drunk freely, and one may drink many glaſſes of them.

Mr. *Morrand* mentions a black mud which is near to theſe ſprings, which is cold, and has a ſtrong ſulphureons ſmell, and feels ſmooth between the fingers. It has been eſteemed uſeful in the cure of old ſores, of contractions of the tendons, and of rheumatiſms, palſies, &c.

FRENCH WATERS.

D'AX EN FOIX.

In the year 1758 Monſ. *Sicre*[a] publiſhed an account of the waters at Ax in the county of Foix.

He ſays, Ax is a pleaſant ſmall town, ſituated partly on a rock, in the high mountainous part of the country of Foix, at the bottom of the Pyrrenean mountains. It is about fifteen leagues ſouth-weſt of Toulouſe, and abounds with warm mineral waters of different temperatures, which may be divided into three claſſes. 1ſt. Thoſe of *Foix.* 2d. Thoſe of the ſuburbs *du Fauxburg.* 3d. And thoſe of *Couloubret.*

1ſt. CLASS. At the bottom of a ſmall mountain, on the banks of the river Ourlu, two ſprings of warm water riſe very near to each other; the heat of the one raiſes Monſ. Reaumeur's thermometer to forty-five (or one hundred and thirty-three and one fourth Fahrenheit's); and the heat of the other to fifty-eight (or one hundred and ſixty-two Fahrenheit's) and a number of air bubbles riſes from its bottom along with the water.

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[a] *Memoire ſur les Eaux minerales D'Ax dans le Comte de Foix, par Monſ. Sicre Maitre en Chirurgie, &c. à* Toulouſe, 1753.

Along the banks, and in the bed of the river, there is a number of other ſprings of warm waters, which emit a thick vapour, eſpecially in winter, and depoſit ſulphureous filaments on the ſtones in their channels.

2d. Class. Thoſe of this claſs are ſituated between the gate of the town and the hoſpital; they conſiſt of five principal ſprings. 1ſt. The firſt is called the *Rouſſignol.* 2d. The ſecond *des Eſcanous.* 3d and 5th have no particular names. 4th. And the fourth is called *de L'etuve.*

	deg.	Fahrenh.
The heat of the 1ſt. and 3d. raiſed the therm. to	60	(or 167)
———of the ſecond to	62	(or $171\frac{1}{2}$)
———of the fourth to	56	(or 153)
———of the fifth to	32	(or 104)

1ſt. The firſt, or *Rouſſignol*, throws up ſuch a quantity of air bubbles, that it ſeems to boil.

2d. The waters of the ſecond, or *des Eſcanous*, are conveyed from their ſprings in artificial conduits, on the internal ſurface of the upper ſide of which ſulphur collects, and may be taken out.

When Monſ. *Sicre* was there he found but a very ſmall quantity of a yellow powder, at the end of this conduit next the ſprings; becauſe Meſſ. *Venel* and *Bayen*, who were employed to analyze all the mineral waters of France, had, about two years before, taken off all the ſulphur from this part; but on opening it at ſome diſtance from thence, he collected fifteen pounds of ſulphur from the length of ten feet: the ſulphur was of a fine yellow citron colour, chryſtallized as a ſalt, and of a very ſhining brightneſs, when expoſed to the light.

Having obſerved that this ſource was formed of two branches, he examined them ſeparately, and found that the water of the one raiſed the thermometer to ſixty, and of the other to ſixty-four; and that this laſt ſeemed to depoſit more ſulphur than the other.

From theſe facts, he thinks, it is evident, that theſe waters contain, and carry along with them, a quantity of ſulphur.

The people of the town make uſe of them for waſhing linen, ſcalding pigs, boiling eggs, and other domeſtic purpoſes.

3d. The third fountain diſcharges a large quantity of water, and covers the bottom of its channel with yellow ſulphureous filaments.

4th. The fourth diſcharges leſs water than the third, and depoſits leſs ſulphureous ſludge. It does not feel unctuous to the touch, and it does not ſmell ſo ſtrong of rotten eggs.

Monſ. *Sicre* put ſome pieces of human calculi into different bottles, filled with the water of the different ſprings; and thought that the waters of the *Etuve* affected them more, and gave more appearances of its being a lithonthriptic than any of the others.

5th. The water of the fifth ſource is unctuous and balſamic, and ſerves for cleanſing wounds.

3d. Class. The waters of this claſs are ſituated at the *Couloubret*, an agreeable walk, which is about fifty paces from the gates of the town. They are drank for health, and are more numerous and of a more temperate heat than thoſe of the other claſſes. There are ſeven principal ſources.

1ſt. The firſt, called the *Manovre*, is now quite forſaken; its heat raiſes the thermometer to thirty-two (or one hundred and four Fahrenheit's); and there is a black bitumenous mud at the bottom of its well, which might be employed with advantage.

2d. The ſecond is near this, and is the moſt temperate of any; it is only uſed as a well for horſes to drink at, and for waſhing linen.

3d. The third is called the *Canalete*, from its water being conveyed in a ſtone pipe to a bath; its heat raiſes the thermometer to twenty-ſix (or ninety-two and a half Fahrenheit's); it feels ſoft and unctuous to the touch, has a ſlight ſmell of ſulphur, and depoſites a fine grey ſulphureous mud. The inhabitants drink it for many diſorders, and eſteem it particularly uſeful in nephritic cholics.

4th. The fourth is called the *Gourgette*, and diſcharges itſelf into a bath, the heat of which raiſed the thermometer to thirty and a half (or one hundred five eighths Fahrenheit's); its water is ſoft, more mucilaginous and unctuous than the former, and both its taſte and ſmell of ſulphur are ſtronger. It is charged with a ſmooth white ſulphureous ſludge of the conſiſtence of the white of an egg, which, he ſays, the ſick ſwallow with pleaſure.

In evaporating and diſtilling theſe waters, nothing occurred particular; the ſediment left was in ſmall quantity; it was of a brown colour, unctuous, and taſted a little ſaltiſh, but yielded no ſalt by lixiviation.

The ſolution of ſilver, dropt into theſe waters, occaſioned a white cloud and a white precipitate.

And ſalt of tartar made them a little turbid and brown, and after ſtanding ſome time they let drop a ſmall quantity of a grey powder.

The white ſlimy ſludge, after being dried, flamed when thrown on the fire, emitted a thick ſmoak, and a ſlight empyreumatic ſmell, then boiled, and left a black dry friable caput mortuum.

It is the moſt frequented of any of the ſprings at this place, except the ſeventh, or *Bain fort*. The waters are drank and likewiſe uſed for baths and injections: they are recommended for the cure of cutaneous diſeaſes, of complaints of the bowels, of the hæmorrhoids, of the gravel, and of a variety of other diſorders; and they are ſaid to be good pectoral remedies.

5th. The fifth ſpring now joins the fourth, and its water is very ſulphureous, and raiſes the thermometer to forty (or one hundred and twenty-two Fahrenheit's).

6th. The ſixth, called the Wooden Canal (*Canal de Bois*) is at the end of the walk: it is very ſulphureous, but not diſagreeable to the taſte; and it is not ſo hot as the laſt. It ſeems to be impregnated with the ſame principles as the *Bain fort*.

7th. The ſeventh, which is the moſt uſed for the cure of diſeaſes, is but a few paces diſtant from the others.

The ſpring is very plentiful, and diſcharges its water into a large baſon. The water is clear and tranſparent, and feels ſoft and unctuous to the touch; it taſtes and ſmells ſtrong of ſulphur, both which it loſes by ſtanding in the open air till cold; but if bottles be filled with it at the fountain, and be immediately well corked and ſealed, it preſerves its ſulphureous taſte and property of tinging ſilver for a conſiderable time.

Its heat raiſed the quickſilver in the thermometer to thirty-ſix and a half (or one hundred and eighteen Fahrenheit's). He put ſome of this water in one glaſs, and an equal quantity of common water, heated to the ſame degree in another, and by examining them with a thermometer at different times found, that for ſome time this water cooled ſlower, then quicker, and at laſt ſlower than the common water, and upon the whole retained its heat rather a little longer, though not much. It is ſpecifically lighter than the water of the river Douerlu.

Neither the vitriolic or nitrous acids, or diſtilled vinegar, dropt into it, produced any change, except that theſe mineral acids cauſed a very ſlight ebullition; but the ſpirit of ſea ſalt occaſioned a very ſlight degree of whiteneſs.

The ſolution of ſilver in ſpirit of nitre excited a ſtrong ebullition, and rendered it of a dirty brown yellow; by degrees it dropt a grey powder and recovered its tranſparency.

The ſolution of corroſive ſublimate whitened it a little, but occaſioned no precipitation of the mercury in form of a red powder.

Oleum tartari per deliquium made it of a brown colour, and after ſome time precipitated a ſmall quantity of a very fine white powder.

But the cauſtic alcali, ſpirit of ſal ammoniac, tincture of tournſol, decoction of galls, and ſyrup of violets, mixed ſucceſſively with different parcels of the water, produced no change.

From which experiments he concludes, that it is neither an acidulous, nor an alkaline water; that it contains neither vitriol, nor iron, or any other metal; but a fat, balſamic, ſulphureous matter, and a neutral ſalt with an alkaline baſis.

He next diſtilled four pounds of the water, and what came over did not differ in any thing from common water; after the diſtillation was finiſhed, he had remaining in the bottom of the retort eleven grains of ſediment, which attracted a little moiſture from the air; and by lixiviating and filtering it he got three grains of earth, and four grains of ſalt, and loſt four grains in the operation.

He afterwards evaporated nine pounds with a ſlow fire, and got forty-two grains of ſediment, from which he obtained five grains of earth and twenty-four grains of ſalt.

The earth, put on a red-hot iron, emitted at firſt a very ſmall blue flame, then turned red; and on cooling was a little yellower, and lighter than before.

The ſalt, on trial, ſeemed to be moſtly a ſea ſalt, mixed with a ſmall portion of natron.

From whence he concludes, that the ſulphureous and unctuous parts of theſe waters are very volatile, and fly off in the time of the evaporation; and that the more fixed principles, or thoſe which remain, are what he calls a neutral earth, mixed with a very ſmall quantity of an oily matter, and ſome ſea ſalt mixed with a pittance of natron.

He obſerves that all the mineral waters at Ax taſte and ſmell more or leſs of ſulphur, and diſcolour ſilver in proportion to their degree of heat, and that the hotteſt was the only one which carried ſulphur in ſubſtance.

He recommends theſe waters for a variety of diſeaſes, and gives inſtances of palſies, rheumatiſms, ſcrophulous ſores, wounds, ulcers, &c. being cured by their uſe; and he adds, that they are uſeful remedies in phthiſis from various ſwellings and tubercles; and tells, that he himſelf was cured of a phthiſical diſorder, which begun with a ſpitting of blood, and which obliged him to leave Paris, and retire into the country, by drinking a pound of the water of the *Bain fort*, mixed with an equal quantity of milk, daily for a fortnight; and then by encreaſing the quantity to three pints daily for ſix weeks more.

The time for continuing in theſe baths, he ſays, is from eight to fifteen minutes; and in common, people take from ſix to twelve baths.

GERMAN WATERS.

BOLL.

The waters at Boll, in the dutchy of Wirtumberg, according to *Bauhinus*, poſseſs ſome degree of warmth, and have a ſulphureous ſmell and taſte.

BADEN IN AUSTRIA.

Baden is a ſmall town ſituated four German, or about twenty or twenty-four Engliſh miles ſouth of Vienna, and is celebrated for its hot ſulphureous baths.

Dr. *Brown*, who gives an account of them in *Philoſ. Tranſact.* N° 59, ſays, there are nine baths in and near this place; two within the town, five without the walls, and two beyond a rivulet called Swechet.

The two baths within the town are, 1ſt. The *Duke's bath*, and 2d. The *Bath of our Lady*.

1ſt. The ſpring which ſupplies the *Duke's bath* riſes under a rocky hill, where there is a paſſage forty yards long, that is a natural ſtove, made by the hot water running under it; and the water is conveyed from thence through wooden pipes into the bottom of the bath; but the ſprings of the other baths riſe under them, and are let in through holes in the plancher, for all the baths are wainſcotted, the ſeats, ſides, and bottoms being made of fir.

The water in the *Duke's bath* is, for the moſt part, clear and tranſparent, yet ſomewhat blueiſh, and maketh the ſkin appear pale in it, as doth the ſmoak of brimſtone. It heightens the colour of gold, and turns white metals black in a few minutes, as does alſo its ſteam. Oleum ſulphuris per campanum, dropt into the water, mixed quietly with it; but oleum tartari per deliquium cauſed a ſtrong ebullition. It gives a fine green colour to the moſs and plants which it waſheth, and leaves often a ſcum on them of a purple mixed with white.

Moſt part of the cave, or arched paſſage, is incruſtated with a white ſubſtance, called by the inhabitants of the country Salt Petre, which at the mouth of the cave becomes harder and ſtony.

Dr. *Brown* cauſed ſome of the pipes through which the bath water runs to be opened, and from the upper part of the pipe took a quantity of fine ſulphur in powder, ſomewhat like flowers of brimſtone, which had been ſublimed from the water, and not depoſed, being found in the upper part of the pipe.

2d. The *Bath of our Lady* is fuller of ſulphur than the reſt, more blue, and leaveth a yellow flower upon the boards, as the others do a white.

The baths without the walls are, 1ſt. The *New bath.* 2d. The *Jews bath.* 3d. St. *John's bath.* 4th. The *Beggar*'s. 5th. The *Bath of the Holy Croſs.*

The baths on the other ſide of the rivulet Schwechet are,

1ſt. St. *Peter*'s, which is greener than the others.

2d. The *Sour bath*, the water of which is clear, and both it and its vapour change the colour of white metals; but after it is once cold, it produces no effect upon them, even though boiled in it.

The hotteſt of theſe baths is not ſo hot as the Queen's bath at the town of Bath in England.

Dr. *Franc. Xaverius de Mare*, in the year 1763, publiſhed a treatiſe in the German

man language, giving an account of the Baden waters in Auſtria; of which we have an abſtract in the 12th volume of the *Commentarii de rebus in Medicina & Scientia naturali geſtis*, page 440, &c.

The authors of the commentary obſerve, that this account is not ſo full and ſo diſtinct as could be wiſhed; however, it confirms ſeveral things mentioned by Dr. *Brown*, and makes us better acquainted with the nature of the water than we were before.

Of late there has been a ſtillicidium or pump erected, which has been called after the Empreſs, the *Bath of Maria Thereſia.*

The heat of theſe waters at their ſource raiſed the thermometer to ninety-eight; however, as he does not mention what thermometer he uſed, the exact degree is not thereby aſcertained; but as Dr. *Brown* tells us, that the waters are not ſo hot as thoſe of the Queen's bath at Bath in Somerſetſhire, it is moſt probable that Dr. *de Mare*'s thermometer was one of Fahrenheit's.

The vapour of theſe baths heightened the colour of gold and tarniſhed ſilver; and on examining the ſubſtance got in the reſervatory of the baths of *Maria Thereſia*, and in the baths of the *Duke*, and of St. *Anthony*, which is commonly called ſulphur, he found it to be really ſo.

From evaporating the waters, and trying a number of experiments, he concludes, that they contain a mixture of ſulphur, vitriol, a martial earth, and an alcaline earth (or ſalt) the baſis of ſea ſalt; and he obſerves, that ſometimes in evaporating them, the vitriolic acid unites with the baſis of ſea ſalt, and forms a Glauber ſalt.

The waters and baths have been uſed with ſucceſs in many diſorders, particularly for the cure of gunſhot wounds, and the complaints which remain after them, as many officers in the Auſtrian army have experienced, in the time of, and ſince the late war.

MANNERSDORF, alſo in AUSTRIA,

Is a bath which is lukewarm, and has a ſulphureous ſmell. Dr. *Brown*, in *Philoſophical Tranſactions*, N° 59, ſays, from the ſubſtance which ſticks to the coppers in boiling, it is judged to be impregnated with ſulphur, ſaltpetre (probably natron, or a calcareous Glauber ſalt) and chalk.

LANDECK, in the county of GLATZ, on the confines of SILESIA,

Is a tepid ſulphureous water, about the warmth of milk from the cow.

Cartheuſer in his *Rudimenta Hydrologiæ*, Sect. 45, tells us, that Dr. *G. H. Burghardts*, in *his account of theſe waters publiſhed at Breſlaw, in* 1744, ſays, he got by evaporating three pounds of this water a ſcruple of earth, which efferveſced with ſpirit of vitriol, after it was calcined, though it did not ſo before.

THE AQUÆ LOSSINENSES OR SSUMBERGENSES.

Theſe waters are ſituated in the mountains, called Sudetis by the antients, which divide Moravia from Sileſia; Dr. *T. Jordan*[a] ſays, they contain a pure ſulphur, or rather its vapour, and a ſmall portion of nitre;

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[a] *Thoma Jordani*; a Clauſoburgo *de Aquis medicatis Moraviæ Commentariolus*. Francofurdi, 1586.

though the exiſtence of this laſt he thinks is rather doubtful.

Theſe waters are tepid, and ſo extremely limpid, that a piece of money thrown into the bath, which is above ſix feet deep, may be ſeen at the bottom. They have a ſulphureous ſmell, and in the mouth they have likewiſe a ſulphureous taſte with a ſmall degree of acrimony, which after ſome time feels bitteriſh.

Theſe waters, evaporated in a glazed earthen veſſel, left no ſediment remaining, but the inſide of the veſſels had become of a dark lead colour, or like black ſhining iron. In diſtilling them in a glaſs retort, as ſoon as the water was all evaporated, the retort burſt with a great exploſion; and on examining the broken glaſs he could not find the remains of any ſediment adhering any where to it. Drank in quantity they prove laxative.

Dr. *Jordan* recommends theſe waters in many complaints of the ſtomach and bowels, and in other diſeaſes; but particularly in cutaneous diſorders; and he ſays, they are both drank and uſed as baths.

There is at this place a large bath which is twenty-ſeven feet long, twenty-four broad, and deeper than the height of the talleſt man.

HUNGARIAN WATERS.

TRENCINIUM.

Near to the town of Trencinium, on the river Wag in Hungary, on to the borders of Moravia, are warm baths, ſituated in a valley among the Carpathian mountains; the waters of which, Dr. *Jordan* ſays[b], have a ſtrong ſulphureous ſmell and taſte, with a ſmall degree of aſtringency, and a greeniſh colour ſomewhat like ſea water.

They have a moderate degree of heat, and are not quite ſo warm as the water of the *Caroline Baths* in Bohemia.

The reſiduum left after evaporation had the appearance of the alumen plumoſum, but had no taſte; it was white, and did not loſe its whiteneſs by being put in the fire, and it emitted no ſmoak.

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[b] *Thomæ Jordani*; a Clauſoburgo *de Aquis medicatis Moraviæ Commentariolus*. Francofurdi, 1586.

In the year 1766, Dr. *Paul. Adam. Pannonius* gives an account of theſe waters [a], of which the following is an abſtract taken from the 15th volume of the *Commentarii de rebus geſtis in Medicina & Scientia naturali* [b]. He ſays, they are perfectly clear and limpid as they riſe up into the bath, but become turbid after they have ſtood ſome hours, and let fall a whitiſh clay-coloured ſediment, which Dr. *Pannonius* affirms is a true ſulphur; from whence he concludes, that the ſulphur found in theſe baths is precipitated, and not formed by ſublimation on the vaults of the conduits, as ſome authors have alledged.

Theſe waters are ſomewhat heavier than diſtilled water, and the heat of the water which is commonly drank raiſed the quickſilver in Fahrenheit's thermometer to one hundred and four.

From a number of experiments he made, he concludes, that theſe waters contain a ſulphureous elaſtic ſpirit, a true natural ſulphur, common ſalt, and a calcareous earth.

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[a] and [b] Vide *Pauli Adami Pannonii Hydrograph. Comitatus Trencſinenſis*, Viennæ 1766. *And Comment. de rebus geſtis in Medicina & Scientia naturali*, vol. xv. part 1. page 50. *Lipſiæ.*

He recommends them in gouty and paralytic caſes; in the dropſy, eſpecially in the anaſarca; in diſeaſes of the primæ viæ; and he thinks they have been of uſe in a beginning phthiſis.

Dr. *Brown* has given an account of the following Hungarian waters in *Phil. Tranſ.* N° 59.

DOTIS.

At Dotis, which is two Hungarian, or fourteen Engliſh miles from Comorra, are two tepid ſulphureous baths.

BANKA, ſituated two Hungarian miles from FREISTAT,

Here there are fifteen open baths, the waters of which are like to thoſe of Baden; and are very hot.

BOINITZ.

At this place are five ſulphureous baths, of a moderate heat.

STUBEN,

Three Hungarian miles from NEWSOL.

Here there are divers baths of great eſteem, the waters whereof are clear, and ſmell of ſulphur, and their ſediment is green; but they do not change the colour of white metals ſo ſoon as moſt others. The heat is anſwerable to that of the *King's Bath* at the town of Bath in England.

GLASSHITTEN.

At Glaſshitten, a Hungarian mile from Schemnitz, are five baths, the water of which gilds ſilver, depoſites a red ſediment, and incruſtates the wood and ſeats of the bath, under water, with a ſtony cruſt. The moſt remarkable of the baths is that called *The ſweating Bath*, where hot ſprings drain through a hill, and fall into a bath built to receive them; at one end of which, by aſcending, one goes into a cave, which is made a noble ſtove by the heat of the water, and ſo ordered with ſeats, that every one who ſits in it may regulate his ſweating, or enjoy what degree of heat he deſireth, by chuſing a higher or a lower ſeat.

EISENBACH.

At this place, which is about four Engliſh miles diſtant from Glaſshitten, are alſo hot ſulphureous baths, the water of which has a petrifying quality.

BUDA.

This city is famed for the nobleſt baths in Europe. Dr. *Brown* ſays, he numbered eight, three in the Eaſt end, and five in the Weſt end of the town; that the bath called *Purgatorium*, as well as ſome of the others, has a ſtrong ſulphureous ſmell. *Buſching*, in his new ſyſtem of Geography[a], mentions a very particular circumſtance of theſe warm ſprings: he ſays, "here are ſome admirable warm baths called *Gerhardſbad*, "*Burgurbad*, *Raitzenbad*, the *Hoſpital Bath*, "and the *Emperor*'s, together with a pond "of mineral water, having this ſurprizing "property, that when the water is entirely "turned off, the warm ſprings ceaſe flowing, but when the pond is filled a little "above half full they return again."

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[a] See the Engliſh tranſlat. of this book, vol. ii. page 41. publiſhed in 1762.

SWISS WATERS.

The waters we are to take notice of, are all mentioned by *Baccius* in his book *de Thermis* [b].

MOUNT ADULA.

Near the caſtle of Burmium, or Worms, at the foot of Mount Adula, or St. Gothard, in the Griſons, is a boiling hot ſulphureous water, which has been alledged to contain nitre.

BADA.

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[b] Monſ. *Gottlieb. Sig. Gruner*, in his Hiſtory of the icy mountains of Switzerland, publiſhed at Bern 1760, of which we have an account in the firſt Supplement to the *Comment. de rebus geſtis in Medicina & Scientia natur.* page 438, &c. mentions ſeveral baths, but gives no particular deſcription or analyſis of them; and it is doubtful whether ſome of them be hot or cold, as he applies the word *Balneum* indifferently to both.

Thoſe he takes notice of, beſides what are mentioned by *Baccius*, are,

1ſt. The *Thermæ Weiſſenburgenſis*, or *Weitzenburgerbad*, ſituated in the country of Bern, and in the valley of Simea, on the rivulet of Buntſchi; the water of which riſes very pure and tepid, and has a vitriolic ſmell, and a mild ſaltiſh taſte.

2d. Near to the ſource of the Rhyne, not far from a place called Vogtiwald, is a tepid fountain which is uſed for health.

3d. In

BADA. ZURICH.

Ten miles from Zurich are the ſulphureous baths of Baden, or Bada, ſo warm that one cannot go naked into them. *Baccius* calls them ſulphureous. Mr. *Buſching* ſays, about a quarter of an hour's diſtance below the town, on both ſides of the river Limmat, are excellent warm baths, which even in the time of antiquity were in high repute.

BRIGENSA AND LEUC.

In the province of Valais, near Brigenſa, is a very warm bath called *Thermæ Brigianæ*, which is tempered by the mixture of a cold ſpring. And likewiſe there are five other warm ſprings and baths in this province near the town of Leuc. *G. Sig. Gruner*, in his account of the icy mountains of Switzerland ſays, there are five ſprings

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3d. In the diſtrict of Brettingen are four excellent baths.

4th. In the diſtrict of Glaron in the Alps, called Wichlerberg, is the Wichlerbad bath, which contains ſalt, vitriol, and ſulphur. And there is another bath called Lochſeiten, which is the beſt in the country of the Urienſes inferiores; but it is not ſaid whether theſe three laſt are hot or cold.

which

which are impregnated with a vitriolic ſpirit and a martial earth.

ABODIACUM, in BAJOARIA, beyond the country of the VALLAIS,

Here there are mineral waters of different ſorts, particularly a famous nitro-ſulphureous bath, at the caſtle of *Abodiacum* above Reginoburg.

HENDEREGGE.

Beyond the mountains, which divide Italy from Germany, is a ſulphureous water, which is called *the Water of the Vulturs*, and near to this a bath, called *Henderegge.*

FALARIS.

In the country of Rhœtia, now of the Griſons, is a bath of warm water, ſituated among rugged mountains, near the Rhine, at a monaſtry of the Benedictines of Falaris, from whence the bath has got its name.

ITALIAN WATERS.

The ſulphureous waters we are to conſider under this head, are moſtly mentioned by *Baccius*, *Fallopius*, and Father *Leandro Alberti.*

BATH of ST. MARY in the BATH, near SARSINA,

Near to Sarſina and Ceſena, in the Romagna, of which Ravenna formerly, and now Bologna, is the capital, are warm baths, which go by the name of St. *Mary in the Bath*; which old authors have alledged to be variouſly impregnated with ſulphur, alum, iron, copper, &c. as their imaginations led them to ſuppoſe. *Fallopius* ſays they contain ſea ſalt, alum, and ſulphur, and tells us that there are three baths here.—1ſt. That of the tower.—2d. The middle bath.—3d. And the bath of the ladies.

He adds, that there are ſeveral other baths in this country; ſuch as thoſe of St. *Marinus*, of St. *Chriſtopher*, and of *Meldula*, but that he had not viſited them, and therefore could give no account of them.

SINVESSA.

About forty-four miles from Naples, on the ſea-coaſt, between Rome and Naples, near the river Liris, is *Sinveſſa* or *Seſſa*, where there are temperate and ſulphureous *Baths*, which were much uſed for the cure of diſeaſes, particularly the one called *Turris Balneorum*.

WATERS near the RIVER TIBER.

Monſieur Nollet, in the *Memoirs of the Academy of Sciences at Paris for the year* 1750, publiſhed in 1754, p. 62. mentions waters which have been diſcovered near the Tiber, about two leagues from Rome, which have a ſtrong ſulphureous ſmell, and are warmer than the atmoſphere; they raiſed Reaumeur's thermometer to twenty, which is equal to nearly ſeventy-ſeven of Fahrenheit's; and are of a whitiſh colour; their vapour corrodes exceeding hard ſtones, and renders them light and friable, and covers their ſurface with flowers of ſulphur.

VOLTERRA OR VOLTERANA.

About ſixteen or ſeventeen miles from the town of Volterana, in Tuſcany, are ſeveral hot baths, which are reckoned ſulphureous, and ſaid, by the old writers on mineral waters, to contain ſalt and alum; and by *Fallopius* and *Baccius* to be likewiſe impregnated with vitriol.

There are here four baths within a large fort or caſtle.

1ſt. The bath for curing diſeaſes, *bagno al morbo*.

2d. The pump-bath, which is ſupplied from the ſame ſpring.

3d. The bath of the boiled cheeſe (caſeus coctus) thought to be called ſo from its ſmell. Its water is very hot.

4th. And a fourth, placed near the door, which contains much ſalt.

Without the fort there are two baths.

1ſt. The one called the bath of the the plain.

2. The other the bath of St. Michael, which is reckoned excellent for the cure of cutaneous diſorders, particularly the leproſy.

Father *Leandro Alberti*, the *Bologneſe*, in his Deſcription of Italy [c] ſays, that three miles from Volterra, near the river Cecina, are ſalt ſprings, from which they prepare ſalt.—That three miles from thence, at Mount Libbiano, is found a black earth, from which they prepare vitriol; and near to this a water called *aqua-forte*, from its ſharp ſtrong taſte; and it is uſed medicinally.—Three miles from this is a place, from whence ſuch fetid ſulphureous vapours ariſe, that the inhabitants of the country, when they go that way, walk as quickly over it as poſſible; and the ſteams are ſaid to kill birds as they attempt to fly over it: the earth from which theſe vapours riſe is yellow, and appears like orpiment; and at this place they prepare ſulphur.—Nine miles from this, near to Leccia, there are ſprings of water which boil up ten feet above the ſurface of the earth, and are ſo hot, that if an animal is thrown into them, they ſeparate immediately the fleſh from the bones.

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[c] Vid. fol. 55.

AQUÆ ALBULÆ,

Are the waters of a deep lake, ſituated on on the road to Tivoli (or fons albunea) under the Tyber, mentioned by Virgil, and other antient authors. Baccius tells us, that they are warm ſulphureous waters, which were much uſed by the antient Romans.

STYGIAN OR CERATINE BATHS.

Theſe baths are ſituated near the ſea-coaſt of Etruria, twenty-eight miles from Rome, near to Tolphanuova. Their waters are hot, acrid, and have a ſtrong ſulphureous ſmell, from whence they have been called Stygian. Baccius ſays they are very efficacious in the cure of cutaneous diſorders.—Near to them, by the lake Sabatis, are the Sabatine baths, which are more temperate and impregnated with iron as well as ſulphur.—Some authors have alledged, *that the Stygian* and Sabatine baths were the ſame; but Baccius deſcribes them as different.

BULLICANUM.

This bath, ſituated near Viterbo, a city in Tuſcany, is very hot; its water is limpid, and has ſomewhat of a taſte, and ſmell of ſulphur.

CAIÆ.

Another ſulphureous bath at Caia, in the Viterbo, which is not ſo hot as the Bullicanum. Baccius [d] obſerves, that there are a vaſt number of warm ſulphureous ſprings in this neighbourhood, which are of different temperatures, and impregnated with ſalt, or metallic ſubſtances, according to the veins of minerals they meet with in the bowels of the earth; for all this country is heated with ſubterraneous fire.

RAPOLI.

At Rapoli, a ſmall village twenty-eight miles eaſt of Siena towards Arezzo, are very hot ſulphureous waters, near to which is a place that ſometimes emits ſuch a ſtrong ſulphureous vapour, as to endanger the life of any perſon who approaches too near, and is perceived at a very great diſtance.

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[d] De Thermis, lib. iv. p. 125.

tance. Theſe baths are much eſteemed for the cure of cutaneous diſorders, and may be uſed with ſafety in the beginning of ſummer, and in autumn.

MOUNT ALCETUM.

Not far from the baths of Rapolum, at the village of Mount Alcetum, is a muddy thick ſulphureous water, which is uſed for the ſcab and ſwellings of the legs; and its mud for contractions of the nerves and wounds of the ligaments.

SATURNIAN BATHS,

Are ſulphureous, and ſituated near the old town of Saturnia, ſeven Italian miles weſt from Soana in Tuſcany. They were in great repute in antient times, but are now neglected.—Near to them are places which emit warm vapours, which are very fit for ſudatories.

VINADUM.

Three miles from the village of Vinadum, in the diſtrict of Coni, in the country of Piedmont, are warm ſulphureous waters. Dr. J. Fontanus [e] ſays there is one ſpring that affords a very hot water which is uſed for baths and ſudatories; and one which is more temperate which is drank. And that there are other ſprings, which moiſten a mud or clay, that is uſed for anointing weak and diſeaſed parts.

Theſe waters ſmell ſtrong of ſulphur, and tarniſh ſilver dipt into them; and they contain a ſmall portion of ſea ſalt, between five and ſix grains in the pint (or lib. i.); very little other ſolid matter is to be got from them by evaporation; though in their ſtreams a number of muffæ or ſoft mucous bodies are found adhering to the ſtones.

The temperate water is drank from two pounds to ten in the day, and it is common to mix a ſpoonful of ſea ſalt with the firſt glaſs, when it is wanted they ſhould operate by ſtool.

The drinking and bathing in theſe waters is recommended in rheumatiſms, ſciatic, palſies, and affections of the joints.

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[e] Vide J. Fontani Commentariolus de quibuſdam aquis medicatis & de Feb. Milliariis, Auguſtæ Taurin. 174

ST. EUPHEMIA IN CALABRIA.

In the country of *Calabria ultra*, formerly of the Brutii, in the north part, on the weſt coaſt, in the town of St. *Euphemia*, *Baccius* ſays there is a bath of hot ſulphureous water which was built by the Romans, as may be ſeen by the ſeats in it; and it is much uſed in the ſummer for the cure of dieaſes. Monſ. *Colonne*, in his *Natural Hiſtory of the Univerſe* [f], obſerves, that the country of Calabria abounds every where with warm ſprings.

PICENUM.

In the country of Picenum are ſeveral hot ſulphureous baths, ſuch as—1ſt. At the caſtle of Petriolum, which is hot and has a heavy ſmell;—2. One in the country of Ancona at *Mount Milvis*;—3. One on the bank of the river Potentia, at the old town of *Septempeda*, now called St. *Severinus*;—and others at *Aſculum*.

[f] Vol. II.

FRIULI.

In the diſtrict of Friuli, in the Venetian territory, near Mount Falcon, is a tepid ſalt ſulphureous ſpring; the waters of which are purgative when drank from three or four to ten glaſſes; thoſe who are very coſtive may drink ten daily; thoſe who are leſs ſo only two or three. It has been recommended in diſorders from viſcid phlegm, in the aſthma, in complaints of the ſtomach and kidneys, in the colic, and other diſorders. They are likewiſe uſed for baths. See *Raccolta di Opuſculi medici riguardanti l'acque miner. dello ſtato di Venezia. In Venezia*, 1760.

ACQUA IN LIGURIA.

At the town of Acqua or Aix, in the ſouthern part of the Milaneſe, called formerly *Civitas Aquæ* in Liguria, near the river Bormia, are warm baths, which *Baccius* ſays are impregnated with ſulphur, nitre, and alum. The water is very limpid, and has a ſtrong ſulphureous ſmell.

One ſpring within the town is extremely hot, and its water is conveyed into different

ferent baths for men and women. And there are proper vapour baths, and balnea ad duccias, or pumps or falls of water.

Without the town there are likewiſe ſeveral warm ſprings, and baths; but none of their waters are ſo hot as that within the the town.

Theſe waters are not only uſed for baths, but likewiſe drank for variety of complaints.

PETRIOLI IN ETRURIA.

On the ſea-coaſt of the country of Siena, near the Via Roſia, among certain mountains called Thinni by Strabo, is a caſtle called Petriolum, near which, *Baccius* ſays, there are a number of mineral waters of different ſorts, and of different temperatures, ſome for drinking, and others for bathing in, and for pumping or letting fall on weak or diſordered parts.—And there is one bath from which they prepare ſulphur (unde ſulphur excoquant) that is hot and extremely ſulphureous; and there is an unctuous matter ſwims a top of it, which, when dried, proves to be a pure ſulphur. The water is of a greeniſh colour, and blueiſh at the bottom; it has a diſagreeable ſmell, and a drying taſte; is harſh to thoſe who uſe it, and makes the ſkin rough: it is not fit for thoſe of hot, and dry conſtitutions.

BATHS AT BAIA, LAKE AVERNUM AND POZZOLI.

In this country, and all round Naples, and mount Veſuvius, the earth is heated by ſubterraneous fire, that is fed by ſulphur; and there are hot ſulphureous waters to be met with, almoſt every where in the neighbourhood.

I do not know that any analyſis has been made of theſe waters, ſince chymiſtry has been much improved, in order to determine the exact mineral ſubſtances with which they are impregnated. Old authors only call them hot and ſulphureous, and add the names of what materials their imaginations let them to believe they were impregnated with. However it will not be ſurprizing, if waters ſo ſituated ſhould, on examination, be found to contain many ſubſtances not commonly to be met with in other waters; for whatever minerals there are in the bowels of the earth, at ſuch places, which can be rendered ſoluble in water by the force of fire, or by the vitriolic acid, or by both; or by calcined calcareous earths, or other ſubſtances, may certainly be found in waters near volcanoes, and heated by ſubterraneous fire.

As *Baccius* and other authors ſay ſo little of the nature, and uſes of theſe waters, I ſhall add a ſhort account of the names and ſituation of ſome of the moſt remarkable from *Leandro Alberti*, who travelled through this country in the year 1526, which may excite the curioſity of medical gentlemen who go that way to examine them more particularly[f].

BAIA.

At Baia are the famous baths called *bagni di Baia*, or *Sylvani*, cut in the rock; not far from which, on the ſea ſhore, s a large chamber or baſon, cut likewiſe out of the rocks, which have been called the *baths of Tritoli*; but by the vulgar the baths of *Cicero*, or of the meadows; a little higher to the left is a grotto, where is the ſource of the waters which fill theſe baths. The water riſes here only once a day, excepting at the new and old moon; it is very hot, emits a great ſmoak, and runs into a baſon cut in the rock; and when that is full it runs over, and forms a little brook which runs into the ſea. Theſe baths were finely ornamented in former times, but are now in ruins.

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[f] See *Deſcrittione di tutta Italia di Fr. Leandro Alberti, publiſhed at Venice,* 1596.

Some ſteps above this bath, is a winding grotto cut in the rock, which is about ſix feet high, and five wide, and has an agreeable ſmell on firſt entering. It is alledged, that if the people walk upright in it they immediately fall into a ſweat; but if they creep along on their hands and feet near to the pavement, they feel cold, which muſt certainly be owing to the warm vapour mounting to the top, or upper part of this ſudatory or bath. On entering this grotto, and deſcending a little on the right, one comes to a very beautiful clear water, ſo hot that one can ſcarce touch it; and it is imagined by many, that this water ſupplies the baths of Cicero, which are below, by ſome ſecret veins.

Near to the mouth of this laſt grotto is a deep ditch, in which is another grotto that runs towards the ſouth; if any perſon carries a lighted torch into it, the air immediately takes fire, and the flame mounts with force to the top of the chamber, and extinguiſhes the torch; and if one go far into the grotto, he will be ſeized with a giddineſs, and drop down dead.

On the right of this are many holes, through which a vapour riſes, ſo hot as if it came from a large kettle of boiling water. The antients eſteemed theſe vapours much, as they ſweat plentifully without requiring other aſſiſtance: according to ſome authors theſe baths were formerly called *bagni di Fritoli*, but now, as we before obſerved, they are called *bagni di Tritoli*. L. Alberti obſerves, that there are many other baths at Baia, which he has not mentioned.

AVERNUM.

Very near the gulph or bay of Baia is the famous lake Avernum, ſo often mentioned by the poets. In very antient times its ſhore was every where covered with thick woods, which prevented a free circulation of the air, which is here highly impregnated with ſulphureous ſteams, and rendered it extremely unwholeſome; but ſince the Romans cleared away the woods, theſe parts are become as healthy as any other part of the country. This lake, which is now much changed in its form by earthquakes, is ſuſpected to have a communication with the ſea, and its water is ſalt, and is ſaid ſometimes to be ſo much impregnated with ſulphureous vapours, when any extraordinary fiery eruptions happen in the neighbourhood, as to deſtroy the fiſh that ſwim in it.

Near the lake Avernum, on the right hand, are the baths of the bow (*bagni de l'Arco*) called ſo from their ſhape; and the baths of Raverius (*bagni de Raverio*) named after the perſon who built them.

On the other ſide of the lake, in the road to Pozzoli, were the old baths of *Tripergola*, called ſo from their being divided into three parts.

Near to this is a hill, or riſing ground, called Monte di Chriſto, where were or are the following baths;

1. The *Bagno di S. Niccolo.*
2. The *Bagno di Scrofa.*
3. The *Bagno di S. Lucia.*
4. The *Bagno de l'Arcolo.*
5. The *Bagno di S. Maria.*
6. The *Bagno della Croce.*
7. Near the ſea ſhore is the *Bagno de Cantarello.*
8. And on one ſide of this is the *Bagno della Fontana.*

On the 29th of September (St. Michael's Day) 1538, there happened a violent earthquake in this country, and the earth opened and vomited up fire, which threatened deſtruction to every where around: it deſtroyed moſt of the baths of Tripergola, and likewiſe many of thoſe in the neighbourhood, and filled up part of the lakes Avernum and Lucrinus, and raiſed on the the fruitful plain in their neighbourhood a barren mountain of melted ſtone, brimſtone, *&c.* which is four miles in circumference at its baſis, and has a hollow on the top, which is fifty paces wide, and it otherwiſe ſo ruined this formerly fine fertile plain, that it is now almoſt barren, and deſerted by its inhabitants.

At the bottom of this new mountain, on the ſide next to Baia, is the church of St. Mary, where is

The petroleum bath (*bagno dell Oleo Petroleo*) where Petroleum is found ſwimming on the ſurface of the waters.

Above the church are the following baths, ſituated a little diſtance from one another.

1. The *Bagno di Culma*, called ſo from the new mountain.

2. and 3. The baths of the Sun and Moon (*bagni de Sole & della Luna*); their waters were thought ſuperior in quality to thoſe of the other baths; the laſt of them is filled with ſand: formerly it was called the emperor's bath.

4. The *Bagno di Gimboroſo.*

5. The biſhop's bath (*detto ſonte di veſcovo*) named ſo, either from the bath having

been built or repaired by a biſhop, or from its water being greatly in repute for the cure of gouty diſorders, and much uſed by old gouty prelates.

Some ſteps from thence is

6. The bath of the fates (*il bagno de fatis*).

7. And the *Bagno di Bracula.*

And not far from this

8. *Bagno della Spelonca*, beſides many other mineral waters, both hot and cold, ſituated in the country of Baia, between the new mountain and mount Miſenum, which it would be too tedious to mention.

POZZOLI OR PUTEOLI.

At Pozzoli are many mineral waters; near the ſhore are the baths of St. *Anaſtagio*, called ſo from a church dedicated to that ſaint.

2. Not far from thence was formerly a bath, which is now filled up, it was called *L'Ajuto dell Huomo*, from the many cures it was thought to make.

3. On the ſame ſhore, on the declivity of mount Calatura, are the *baths of Calatura.*

4. And under the rocks of the ſame mountain is the bath for the ſtone (*bagno di pietro*); its waters being thought to be a ſolvent of the ſtone in the bladder.

5. A little further is the little bath (*bagnuolo*).

6. Beyond this is the bath of the ruſhes (*il bagno di giuncara*) called ſo from the number of ruſhes that grows round it.

7. Nearer the ſhore is the bath of the grotto (*il bagno della grotta*).

8. And nearer to Pozzoli, on the ſouth ſide, in the biſhop's garden, is a very hot place or ſudatory, called *bagno d'orto donica* or *del veſcovo.*

In going from Pozzoli towards Naples, there is a vaſt number of ruins for above a mile, at the end of which is the *ſolfataria,* which is a place abounding with ſulphur; and where they dig it up in quantity, and prepare it for ſale: near this is a field, ſurrounded by rocks, which is perpetually burning, and like a large furnace vomits up fire and ſmoak, with a great noiſe; from whence it has been called by the poets *Forum Vulcani.*

Near this is a large ditch full of a thick black water, that perpetually boils, and emits a thick ſteam[g]; round this ditch, and on the neighbouring hills, are a number of holes and crevices, which perpetually ſend out a ſtrong ſulphureous vapour and ſmoak, which is often carried by the wind as far as Naples. Monſ. *Nollet* ſays, that this vapour has a ſharp acid taſte, and turned blue paper red.

On paſſing the hill, which ſurrounds the *ſolfataria*, towards the eaſt, appears the valley where they make alum, from ſtones taken out of theſe hills. They burn the ſtone in a furnace, and when they take it out they lay it in heaps, and pour water drawn from neighbouring wells upon it for ſome days, till it falls down into a powder; after which they boil it up, and extract the lixivium, and then put it into wooden veſſels, where by degrees the alum adheres to the ſides, in form of beautiful chryſtals of about an ounce weight.

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[g] The water of this ditch, however, is not ſo hot as one would at firſt judge from its appearance; for Monſ. *Nollet* tells us, in the *Mem. of the Academy of Sciences for* 1750, that he tried its heat with one of Reaumeur's thermometers, and that it only raiſed the quickſilver to thirty-four degrees, which is only equal to one hundred and eight and half of Fahrenheit's: he therefore concludes, that the boiling is not owing to actual heat, but to a ſubterraneous vapour, which riſes up below the water in certain places, particularly near the ſides of the lake or ditch, for it is only near the ſides that the water appears to boil.

A little north of this are the high hills of Aſtruno, in the middle of which is a very large hollow, of the figure of an amphitheatre, not far from which is a pool of water, to the left of which are the *baths of Aſtruno*, which are ſupplied by two fountains.

Further on the road towards Naples is the lake Agnano, near to which are the *baths* or *ſudatories of lake Agnano*, commonly called the ſudatories of St. Germano, which are compoſed of a number of ſmall chambers, filled with warm vapours that ſoon bring out a ſweat, and which have been much uſed for the cure of diſeaſes.

A little further to the right, at the bottom of a high rock, ſurrounded with the lake, is a hole or cave, called *buco velonoſo*, or *grotta delli cani*, the bottom of which is filled with a very fine inſenſible vapour, which ſoon ſuffocates animals thrown into it; this vapour does not riſe above a foot from the ground, which renders it probable that it is a body of heavy, foul, or fixable air, or the ſteam or vapour riſing from a heated ſulphureous pyrites. The vapour at the bottom of the grotto, Monſ. *Nollet* ſays, raiſed Reaumeur's thermometer to twenty-five, or eighty-four and a quarter of Fahrenheit's, while the external air round it only raiſed it to eighteen or ſeventy-two and a half Fahrenheit's.

Nearer to Pozzoli, a little to the left of the ſame road to Naples, is a dry barren hill which is continually ſmoaking; near to the bottom of which are ſeveral caverns filled with water, that conſtantly boils, and makes a great noiſe and ſmoak, from whence they have been called the *baths of Bulla*. The neighbourhood of theſe baths is quite barren and deſerted.

ISLAND OF *CORSICA.*

In this Iſland are many hot ſulphureous waters, ſuch as the baths of *Petra Pola*, on the promontory of Cape Corſe, oppoſite to Tuſcany, at the river Aleria, the water of which is ſo hot as to bring the feathers off a fowl, and are reckoned good for cutaneous diſorders. Not far from this *L. Alberti* ſays there is a water ſtill hotter. Eighteen miles from Adjacio are the baths of *Caldanæ*, which are of a temperate heat. Baccius ſays the waters purge mildly, and go off by urine.

ISLAND OF *SICILY.*

There are in this iſland mineral waters of different ſorts, and temperatures; hot, tepid, cold, acidulous, ſulphureous, ſalt, &c.

Baccius and *Leandro Alberti* mention three remarkable warm baths, in this country.

1. The baths at *Thermæ Himeræ*, ſituated on the north ſide of the iſland towards the weſt end, on the coaſt of the Tyrenian or Tuſcan ſea; they were much uſed as baths and ſudatories in former times; and *Baccius* ſays they are ſalt and ſulphureous.

2. The baths at the town of Segeſta, ſince called *Drepanum* and *Trapani*, ſituated near the weſt end of the iſland; they were formerly called *Balnea Segeſtana*; *Baccius* ſays the waters are ſulphureous and very hot, and they are drank as well as uſed for baths; and he obſerves, that *Savonarola* mentions three ſprings of water here;—1. one hot;—2. and another hotter;—3. and the third of a boiling heat: and he adds, that a ſtone's throw from thence is the lake Herberus or Gurgus, the water of which is ſulphureous and hot.

3. The baths at *Sacca*, formerly called *Thermæ Selenuntinæ*, ſituated on the ſouth ſide of the iſland, near the weſt end, about twenty-four miles eaſt from the city of Mazzara. *Baccius* mentions their waters as ſalt. There is a bath here, and likewiſe a remarkable antient ſudatory, which

is compoſed of a number of chambers into which the warm ſteams and vapours riſe; and there are ſeats cut every where in them for the uſe of thoſe who want to ſweat. This ſeems to be the ſame as that mentioned by Monſ. *Colonne*, as ſituated on the top of mount St. Calocero; near to which he alledges there is a fountain of clear water, which operates by ſtool almoſt inſtantaneouſly after it is drank.

Monſ. *Colonne*, in his *Natural Hiſtory of the Univerſe* [h] obſerves, that in the neighbourhood of mount Ætna there are numbers of ſprings, or ſources of acid, boiling, and ſulphureous waters; and that in ſuch places the water is often accompanied with flames, as it riſes out of the earth, and is commonly mixed either with ſulphur, vitriol, bitumen, aſhes, burnt ſtones, metallic matters, or ſalts.

In the middle of the iſland, he ſays, there are two famous lakes, ſituated about a mile and a half from each other; the one is called *Perguſe*, formerly the lake of

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[h] Vol. ii. p. 17. &c.

Proſerpine; the other *Melphiti*, formerly the lake of *Pelicorus*. The waters of both theſe lakes are very fetid, ſulphureous, and bitumenous, particularly the lake of *Pelicorus*, from which the Sicilians gather bitumen; and they are filled with aſhes; theſe waters are always boiling, and riſe above three cubits high, and are often mixed with flames.

ISLAND OF *SARDINIA*.

Baccius tells us, that in the dioceſe of *Oriſtano*, in the middle of the iſland, there are the remains of ſome baths, with their warm ſprings.

And F. *Leandro Alberti* ſays there are warm baths between the caſtle of *Monte Regali* and *St. Giovanni*.

CLASS III.

OF HOT WATERS IMPREGNATED WITH METALLIC MATTERS.

IN treating of cold waters I mentioned ſome few which contained copper, but although *Baccius*, and ſeveral other authors, ſpeak of hot ſprings of the ſame kind, yet I have not hitherto met with an account of any, which have been proved by undoubted experiments to contain copper; or which yielded true chryſtals of *vitriolum martis* on being evaporated; and, therefore, I ſhall at preſent only conſider ſome of the hot chalybeate waters, ranged under the following heads.

1. Thoſe which contain a native *alkaline ſalt*, or *natron.*

2. Thoſe which contain *ſea ſalt.*

3. Thoſe which contain a *calcareous Glauber ſalt.*

4. Thoſe which have a ſtrong ſulphureous ſmell.

5. And laſtly thoſe which contain only a ſmall portion of any ſolid matter, or which have been mentioned, but not particularly deſcribed by authors.

CHAP. I.

OF HOT CHALYBEATE WATERS WHICH CONTAIN A NATIVE ALKALINE SALT OR NATRON.

THE waters of this claſs, like the cold ones formerly mentioned, generally contain other matters beſides natron and iron; and are impregnated more or leſs with volatile principles, and they have the ſame general properties as the cold ones of the ſame claſs.

Thoſe we ſhall conſider at preſent are,

FRENCH.	*GERMAN.*
VICHY.	CAROLINE.

FRENCH WATERS.

VICHY.

In the BOURBONNOIS.

Mr. *Burlet*, in *the Memoirs of the Academy of Sciences for* 1707, ſays, there are ſeven ſprings here, ſix of which he examined, *viz.* four hot and two cold; and one which he did not, *viz.* the fountain *des Celeſtins.*

Thoſe he examined were,

1. and 2. The two ſprings of the *Capucins.*

3. The fountain of *la grille.*

4. The fountain called the *grós boulet.*

The two cold ones were,

5. and 6. The fountains called *fontaines garnies.*

1. and 2. The two ſprings, *des Capucins*, he thinks ariſe from the ſame ſource, and have a conſiderable degree of heat; for the liquor, which ſtood at 24 lines in the open air, in a thermometer nine inches and a half long, excluſive of the ball, roſe in the tube to fifty-one lines, when put into

one of the wells, and to fifty-one and a half when put into the other.

The waters of theſe two fountains appear ſomewhat whitiſh in the wells, but are clear and limpid in the glaſs; their ſmell is ſtrong, and ſeems to partake ſomewhat of burning ſulphur, and their taſte ſharp, ſaltiſh, and diſagreeable.

They preſerved their heat long, became turbid with lime water, and ſtruck a faint colour with galls; they did not change the colour of the ſolution of tournſol, nor reddened blue paper, and they ſtruck a green with ſyrup of violets.

Four pounds evaporated left two drachms and nine grains of ſediment; when ſix drachms and thirty-two grains of the water were evaporated to drineſs, in a glaſs veſſel, over a ſlow fire, the veſſel had increaſed three grains and a half in weight.

3. The fountain of *la grille* raiſed the thermometer to fifty lines; its water is lixivial, and ſaltiſh to the taſte, is very clear and limpid, and has ſomewhat the ſmell of melted ſaltpetre; evaporated it yielded nearly the ſame quantity of ſolid matter, as the fountains of the *Capucins*.

4. The water of the fountain of the *gros boulet* is only tepid (*tiede*); it has a ſharper taſte than that of *la grille*, and a ſmell which participates of iron; it is ſtronger, and more purgative, and becomes of a deeper colour with an infuſion of galls; and a Paris pint yielded thirteen grains of ſediment. The mud of a ſmall rivulet, into which it diſcharges itſelf, is black, and ſome particles of it were attracted by the loadſtone.

5. and 6. The water of the two cold ſprings, the *fontaines garnies*, is much of the ſame nature as the hot, but its taſte is ſomewhat on the acid; it is leſs charged with ſalt than that of the *groſs boulet*, and ferments leſs with acids, and ſtrikes a pale red with galls, like to pale red wine (*vin paillet*).

The ſalt of theſe waters, when examined, proved to be of the alkaline lixivial kind.

Mr. *Burlett* ſays, that ſeveral attempts were made to obtain a ſulphur from them, but without ſucceſs; though he ſuſpects that they contain ſomewhat of a latent ſulphureous principle, for their reſiduum, when thrown on a red hot-iron, in a dark, room, gave a blueiſh flame, and ſmelt a little of gunpowder.

He tells us, that Mr. *Fouet*, who had the care of theſe wells, affirmed, that the waters contained nothing bitumenous; that the loadſtone attracted ſome particles of of their ſediments left after evaporation; that paper dyed blue with the juice of the tournſol, which was put over the grate of the fountain of *la grille*, and over the ſmall well of the *Capucins*, and let remain for a night, was not changed in its colour next morning; and that the ſame ſort of paper reddened by dropping ſpirit of vitriol on it, recovered its blue colour by being put over theſe fountains, and let lie for a night.

He concludes, from theſe experiments, joined to the nature of the ſalts found on the ſides and arches of the fountain, that the ſalts, which evaporate from theſe waters, are of a volatile alkaline nature.

Du Clos evaporated the waters of the fountain of *la grille*, and likewiſe of the *groſs boulet*, and ſays they yielded $\frac{1}{176}$ part of ſediment, and that $\frac{1}{22}$ part of this was earth, which diſſolved moſtly in wine vinegar, and the reſt a native alkaline ſalt.

Mr.

Mr. *Geoffroy*, in the *Hiſtory of the Memoirs of the Academy of Sciences for* 1702, affirms, that the waters of Vichy contain a lixivial ſalt, and a ſmall portion of a vitriolic ſalt.

Dr. *Claud. Fovetius*, in the *Act. Erudit. Lipſiæ for* 1687[i], ſays, there are ſix fountains here, ſituated near each other, which have different degrees of heat; that their ſmell is ſomewhat like that of ſpirit of ſal ammoniac; that the taſte of the hotter ſpring is ſweet and inſipid, of the others ſaltiſh, and a little bitter; and that when the waters are diſtilled to drineſs, the water which comes over is inſipid, and there remains a whitiſh bitteriſh ſalt, which is entirely diſſolved in diſtilled vinegar.

This ſalt does not crackle nor fly in the fire; it turns ſyrup of violets green; when diſſolved, filtered, and evaporated, it becomes purer and whiter, and may be obtained in a chryſtalline form; it is purgative, and is the more ſo the leſs it is freed of its earth. By every trial it proved to be a native alkaline ſalt, the natron or nitre of the antients.

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[i] See page 634, and the additions to Baccius de Thermis, or Lib. viii.

The waters themſelves, when mixed with galls, become of a pale red; and the ſediment, found at the bottom of their wells, is of a blackiſh colour, ſeems fattiſh, or bitumenous, but does not flame when thrown on the fire.

Mr. *Burlett* ſays, that theſe waters are purgative, and promote perſpiration and urine; that they often do not purge on firſt drinking them, but frequently afterwards operate too ſtrongly; that they are uſeful in diſeaſes which proceed from crudities, or from obſtructions of the firſt paſſages, but are hurtful in diſorders of the breaſt, and in dry and bilious temperaments.

He obſerves likewiſe, that the cold waters are more purgative than the hot.

GERMAN WATERS.

CAROLINE BATHS,

Situated at Carlſbad in Bohemia.

Formerly there were only two ſprings of warm water known at this place.

1. The firſt called the *prudel*, or furious ſpring, is ſituated in the middle of the town, and its water is extremely hot.

2. The *muhlbrunn*, or ſpring near the mill, without the town, the water of which is tepid.

3. But there has ſince been diſcovered a third ſpring, called the *neubrunn*, and afterwards others which are mentioned by late authors; and, therefore, we ſhall begin with conſidering the two, of which Dr. *Hoffman* has given a very particular account.

Probably this new ſpring, or ſome of thoſe mentioned by Dr. Becher, may be the waters taken notice of, but not particularly deſcribed, by Dr. *Hoffman* [k], who, after telling that there are a number of acidulæ in the neighbourhood of Carlſbad, ſuch as the water called *bauchſauerling*, which is drank by the bathers, and is got in a wood about a mile from the town, and others which iſſue from the hill called *der ſauerlings berg*; he ſays, what is very ſurprizing is, that immediately beyond the ſpring of the *furious* or *prudel* water, there riſes up, in a place a little lower, a ſpring of a tepid acidulous water, which ſhews itſelf to be of the true acidulous kind by its taſte, and ſtriking a black colour with galls.

1. The water of the *prudel* fountain ſprings up with great force and noiſe; it is very clear, and ſo hot, that if fowls or hogs be dipt in it three or four times, the firſt will loſe their feathers, and the others their briſtles.

It ferments with all acids, blunts them, and forms a neutral ſalt; it gives the ſyrup of violets a green colour; extracts a reddiſh tincture from rhubarb; and makes a ſolu- of corroſive ſublimate of a yellow colour.

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[k] Hoffman. *Oper. Tom.* v. p. 178, *de Therm. Carolin. cap.* iv. § 8.

It turns blackiſh with an infuſion of galls; becomes white, turbid, and depoſites a ſediment with *oleum tartari per deliquium*, and likewiſe with a ſolution of *ſaccharum ſaturni*, and of ſilver.

It throws up to the ſides of its baſon a large quantity of ſtony matter, and it covers the inſide of the pipes, through which it is conveyed to the bath, with a ſtony cruſt; and when it ſtands expoſed to the air for twenty-four hours, it throws up a ſcum which is compoſed of a fine earth, effervefces with acids, and one-half of it is ſoluble in them.

Evaporated, two medical pounds yielded a drachm of ſediment, from which he got half a drachm of a native alkaline ſalt, and ſeventeen grains of earth, which was partly gypſeous and partly calcareous; and he loſt thirteen grains in performing the proceſſes, by which he ſeparated its different parts.

Dr. *Chriſt. Mich. Adolphus*[1] ſays of this the prudel water, that it is much hotter, heavier, and harder than the muhlbrunn, and is as it were ſaponaceous; that it has an ungrateful, nauſeous taſte; and that four pounds evaporated, afforded a drachm of a lixivial alkaline ſalt, and two ſcruples of a martial ochreous and calcareous earth.

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[1] *Chriſt. Mich. Adolphus*, tractatus de quibuſdam aquis ſoterris, pag. 228.

Dr. *Hoffman*, in his account of the *muhlbrunn* ſpring, ſays, that theſe waters afford nearly the ſame phænomena on mixing various liquors with them, as thoſe of the other hot ſpring above-mentioned; but that they do not depoſite any ſtony or thick cruſty matter on the ſides of the pipes through which they paſs, nor in their receptacles.

Two pounds of this water evaporated left a drachm of ſediment, which contained forty-three grains of pure ſalt, and but five grains of an earthy ſubſtance. The ſalt is partly alkaline and partly a calcareous Glauber.

Dr. *Adolphus* tells us, that the water of the *muhlbrunn ſpring* is tepid, that it is limpid at the fountain; but when taken up in a glaſs throws up a number of air bubbles, which appear at firſt like ſo many white pearls, ſhaked together; it ſtrikes the noſe with a tickling ſenſation, and when weighed is lighter than river water.

Drank at the fountain, it makes ſome people giddy, and as it were drunkiſh on firſt uſing it; in the ſame manner as the Pyrmont, Spaw, and ſome other of the briſk, cold, chalybeates do.

If the veſſels in which it is kept be expoſed to heat, it often burſts them with a great exploſion; and if they be not carefully filled, and well ſtopt it becomes effete.

It has a pleaſant, ſubacrid, ſaltiſh, acidulous taſte, like the cold, briſk chalybeates; mixed with galls it becomes immediately of a dark red or purpliſh colour; with ſyrup of violets, it becomes greeniſh, and by ſtanding acquires a more intenſe green colour.

With oleum tartari per deliquium it neither becomes turbid nor thick, nor does it acquire much of a whitiſh colour. It does not coagulate milk; but, on the contrary, rather makes it more fluid; mixed with aquafortis, a ſubtile vapour ariſes, with ſpirits of vitriol an effervefcence enſues.

It becomes milky with a ſolution of alum, and a ſolution of vitriolum martis occaſions ſome clay coloured flocculi to float in it, and a ſlight precipitation follows.

Evaporated over a very ſlow fire, four pounds yielded two drachms and ten grains of ſediment; of this, only ten grains were an earthy powder, and two drachms a pure white ſalt, compoſed of the native alkali, and a ſpecies of the calcareous Glauber.

From theſe accounts of the waters of the two noted ſprings at Carlſbad, we ſee that the one is hot, and the other only tepid; that they are both chalybeates, and impregnated nearly with the ſame principles, though in very different proportions; that the one contains a large portion of earth, and a ſmaller quantity of ſalt, which is a pure native alkali; that the other contains but a very ſmall quantity of earth, and double the quantity of ſalt, which is not a pure alkali, but a compound of natron and a calcareous Glauber ſalt; and hence, Dr. *Adolphus* ſays, that ſixteen glaſsfulls of the muhlbrunn water purges freely, when it takes thirty of the other to produce the ſame effects.

Neither the experiments of Dr. *Hoffman* nor of Dr. *Adolphus* are ſufficient to determine whether theſe waters contain a volatile acid which keeps their earth ſuſpended; or whether the earth is diſſolved in the water, by being reduced to the ſtate of a quicklime in the bowels of the earth, by having been ſomehow or other deprived of air. It is moſt probable, that they both contain a mineral ſpirit, and volatile acid, particularly the *muhlbrunn*, from its ſtriking the noſe with ſomewhat of a pungent ſmell, from its making people drunk or giddy at firſt uſing, from its effervеſcing with acids, and from its burſting its bottles when expoſed to heat; and the water of the *prudel* producing the like effects, and its throwing up an earthy ſcum, make it ſuſpicious that it contains the ſame volatile principles; though the lithonthriptic quality, that it has lately been diſcovered to poſſeſs, makes it very doubtful, and ought to lead thoſe who analyſe theſe waters hereafter to endeavour to determine this fact.

The waters of the *prudel* fountain, Dr. *Hoffman* ſays, have this almoſt peculiar to them; that, although drank as hot as poſſible,

ſible, they prove ſtrongly purgative, ſo as to occaſion ten or more motions downwards; whereas other fluids taken too hot, prove aſtringent, and rather act by ſweat; yet, this purgative virtue neither palls the ſtomach, nor diminiſhes the ſtrength.

He ſays, that it is alſo remarkable, that upon the internal uſe of theſe waters for ſome days, the feet generally ſwell; but this inconvenience is preſently removed by three or four times bathing, and that it ought to be obſerved, that the drinking of them, either hot or cold, is not without ſome danger, as being apt to ſtagnate in the body, and paſs with great difficulty by ſtool and otherwiſe; and that on account of the crudity and groſſneſs of theſe waters, it becomes neceſſary, not only in the courſe of drinking them, but more particularly when the courſe is over, to take ſome purgative medicines, that may prevent the fatal obſtructions, they might otherwiſe occaſion in the inteſtines and habit of body.

Thoſe who bathe in this water whilſt it remains conſiderably hot, generally thence acquire the head-ach, palpitations of the heart, and fall into intermittent, or even continued fevers, eſpecially if they have not drank the hot waters firſt.

He alledges likewiſe, that theſe waters do not agree with phthiſical or dropſical patients.

Dr. *Balth. Ludov. Tralles*, in a German poetical treatiſe, that he publiſhed at Breſlaw in 1756, on the Caroline baths, tells us, that the prudel water has been much uſed in diſorders of the ſtomach and bowels, in obſtructions of the glands, in the gout, in the palſy, and in variety of other diſorders.

And Dr. *Gottlob. Carol. Springfield*, in a *treatiſe publiſhed at Leipſick* in 1756, affirms that the prudel water is a very powerful lithonthriptic or diſſolver of the ſtone, and he relates many experiments of its diſſolving calculi put into it, and likewiſe ſeveral cures of graveliſh complaints performed by the uſe of theſe waters. He alledges, that not only the prudel water itſelf, but alſo the urine of people who drink it, is a more powerful diſſolver of calculous concretions than the beſt lime water, which, he ſays, was proved by experiments made with both.

The *muhlbrunn* water, Dr. *Hoffman* ſays, is of a leſs dangerous nature than the other, which is hotter and more impregnated with earth, and it is preferable to it in many caſes; it is more purgative, and neither occaſions the ſleepineſs, nor ſwelling, and diſtenſion of the body, which the prudel conſtantly does; beſides perſons of tender and delicate conſtitutions, thoſe of weak nerves, thoſe ſubject to ſpaſmodic diſorders, and tremblings of the limbs, as alſo thoſe afflicted with large bleedings at the noſe, or otherwiſe, may both drink the *muhlbrunn* water, and bathe in it without any danger of ſuch violent ſymptoms, as attend the external and the internal uſe of the ſcalding hot ſpring.

Dr. *C. Mich. Adolphus* recommends the uſe of this water in weak relaxed habits, in diſorders of the ſtomach and bowels, in caſes of glandular obſtructions, in diſorders from viſcid fluids, in female obſtructions, in many cutaneous diſorders, in caſes of old ſores and ulcers, and in variety of other complaints. And he ſays, they may be drank and bathed in by people of all ages, habits, and conſtitutions with ſafety.

In the year 1766, Dr. *David Bechers* publiſhed at Prague *a treatiſe on theſe waters in the German language*, of which the following is an abſtract taken from the *14th volume of the Commentarii de rebus Geſtis in Scientia naturali & Medicina, part 2, pag.* 454, *&c.*

Dr. *Bechers* mentions five ſprings of hot water at this place, which is two more than was formerly taken notice of;

1ſt. The *furious* (or *Sprudel)* the water of which raiſes *Fahrenheit's thermometer* at all times to 165, as it riſes out of the ſpring, and to 163, as it is uſed. It's taſte is ſaltiſh, and a little lixivious, and ſomewhat auſtere or aſtringent.

2d. The new ſpring (*neubrunn*) the water of which raiſes the thermometer to 143; and it's taſte is aceſcent (but not ſo much ſo as that of the mill ſpring) and a little aſtringent.

3d. The garden ſpring (*gartenbrunn*) which raiſes the thermometer from 133 to 135; its taſte agrees with that of the new ſpring.

4th. The mill ſpring (*muhlbad*) which raiſes the thermometer from 108 to 114; its taſte is gratefully aceſcent, but not in the leaſt aſtringent.

5th. The ſpring of the rocks (*felſen-brunn*) which raiſes the thermometer from 112 to 117; its taſte is neither acid nor auſtere, but like to that of pure water, with a ſmall quantity of neutral ſalt diſſolved in it.

The ſmell of all theſe ſprings is like to that of common water, only it is a little lixivious.

The waters of all are pellucid at the fountain, though thoſe of the *furious*, *new*, and *garden* ſprings ſoon become white, when let ſtand to cool; but thoſe of the *mill* and *rock* ſprings preſerve their pellucidity, till they become cold.

The waters let ſtand in glaſſes, throw up a fine white cuticle compoſed of a fine earth, and in twenty-four hours thoſe of the *furious*, *new*, and *garden* ſprings drop a pale yellow fine powder; the ſpecific gravity of all is the ſame, and they are heavier than diſtilled water.

They contain the vitriolic acid; for if any reſinous wood be long macerated in

them,

them, it emits a ſulphureous ſmell when burnt. Iron immerſed in them ſoon contracts a ruſt, and they curdle a ſolution of ſoap; but this acid is in a volatile ſtate, and is ſlightly united with an alcaline ſalt and ſome particles of iron; for on ſtanding theſe waters ſoon let drop their earth and iron, which are again diſſolved on the addition of ſome drops of the vitriolic acid.

This ſame acid is eaſily diſſipated by heat, and hence the hotteſt ſpring is the leaſt acid, and they loſe their acidity in part, by letting them ſtand to cool, and after they are cold, if they be again heated they loſe it entirely. The *mill, new,* and *garden* ſprings are more acid than the *furious.* And the acid in the *rock ſpring* is more intimately united with the alcali, and affords a larger portion of neutral ſalts.

They are impregnated with a mineral ſpirit, though it is not ſo conſpicuous as in many of the cold acidulæ, but it is manifeſted by putting the waters under the receiver of an air-pump; for on exhauſting the air, they throw up a much larger quantity of air than common water; mixed with Rheniſh wine and ſugar, they make a ſtrong ebullition and throw up a froth or quantity of air bubbles a top, and they make the corks of their bottles fly.

Evaporated, they yielded ſome grains of an alcaline ſalt mixed with ſea ſalt, and an earth which is of two ſorts; an alcaline, which Dr. *Bechers* calls magneſia catholica, and efferveſces with, and is ſoluble in acids, and an argillaceo-ſelenitical which is not; this laſt felt fattiſh to the touch, and mixed with water, and formed into bricks, which cracked when burnt in the fire.

In order to obtain the neutral ſalts, with which theſe waters are impregnated, in a cryſtalline form, he ſet a machine with twenty evaporating glaſſes filled with the thermal water over the *furious fountain*, ſo that the bottom of the glaſſes touched the water, and he allowed them to remain for above twenty-four hours, till the water was ſo much concentrated, that one of the evaporating glaſſes was capable of containing the whole; and then he evaporated to a pellicle, and chryſtalliſed, and purified the cryſtals by repeated ſolutions in water, and on examination found the cryſtals to be thoſe of a pure Glauber ſalt in every reſpect; the addition of oleum tartari per deliquium to their ſolution in pure water, occaſioned no white cloud, as it does with ſolutions of Sedlitz or Epſom ſalts. He obſerves, that they prepare annually about 300 weight of this ſalt in this manner.

After all the true Glauber ſalt was ſeparated, he obtained ſome chryſtals of ſea ſalt, and laſt of all a ſmall portion of foſſil alkali.

The pale, brown, yellow ſediment which the waters drop, proves on trial to be of the true ochreous or ferruginous kind, for it is reducible to iron, by the addition of a phlogiſton and the force of fire.

CHAP. II.

OF HOT CHALYBEATE WATERS WHICH CONTAIN SEA SALT.

MANY hot chalybeate waters contain more or leſs of this ſalt; but we ſhall at preſent only conſider a few of thoſe, in which it has been found to be the moſt prevalent ſaline matter, which are

ENGLISH.
BATH.
MATLOCK.
GERMAN.
NEIDERBRON.
WISBAD.
ITALIAN.
AOSTA.

ENGLISH WATERS.

BATH,

In the County of SOMERSET,

Has long been famous for its warm mineral waters.

There are ſeveral ſprings or ſources here, but their waters are all of the ſame nature.

There are three that are principally uſed: 1. The King's bath; 2. The croſs bath; 3. The hot bath, though there are generally ſix mentioned; but three are only appendages to the others. The ſix are,

1. The King's bath; 2. The Queen's bath, which is ſupplied from the King's; 3. The croſs bath; 4. The hot or long bath; 5. The lazar or leper's bath, which

receives its water from the hot bath; 6. The horſe bath, which is filled by the waſte water of the firſt and ſecond.

The water, as it riſes from the ſpring, or is diſcharged by any of the pumps, is quite clear and colourleſs; it ſparkles in the glaſs, and when viewed in the ſun appears as if a number of little flies were playing on its ſurface; it abates of its pellucidity as it cools, and in ſome hours it gets a milky or rather a whey-like appearance, and depoſites a pale yellow ſediment, which ſtains linen or leaves with what are commonly called iron marks or moles.

Neither the water nor its vapour has the leaſt fetid, ſulphureous, or other ſenſible ſmell, as it comes from the pump; but ſometimes one perceives ſomewhat of the acid ſmell of the pyrites as the bath is filling.

It is very pleaſant to the palate, and has only a very ſlight ſaline, bitteriſh, and chalybeate taſte, which is not diſagreeable.

Dr. *Lucas*, who examined and analyſed the Bath waters with care, gives the following account of them:

He ſays, that the water, as it ſprings up, brings along with it a mineral ſubſtance in form of ſand, which he found to be ſmall particles of the pyrites ſtone, which is compoſed of an acid united to iron, and a very ſmall portion of a phlogiſton in a very volatile ſtate; and that in the ſummer and autumn months, there is found on the ſurface of the baths a greeniſh ſubſtance, which is the alga or conſerva, an aquatic plant, but which went long by the name of Bath ſulphur, and was believed to be a mineral ſulphur [m], though it had formerly been particularly deſcribed, and its nature aſcertained by Mr. *Guidot* [n].

It mixes with both the vegetable and mineral acids, without any commotion, or other ſenſible change.

Five drops of an infuſion of galls dropt into two ounces of the Bath water, as it comes from the pump, ſtrikes a pale roſe purple, which a greater quantity of the infuſion rather obſcures than heightens; ſoon after this mixture the water becomes milky and turbid; and, in about eight hours, the colouring matter appears precipitated, leaving the water of a whey colour, with its ſurface covered with a variegated pellicle; on ſtanding, the liquor grows finer, turns to a blueiſh colour, and then to a perfect green.

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[m] When the baths are cleaned a number of nut ſhells peach ſtones, and other ſuch things, are found mixed with the mud, and were formerly believed to be brought there by the water; but I think Dr. *Lucas* is right, when he ſays, that they have been thrown over the rails into the baths.

[n] Treatiſe *de Therm. Britan.* 1691, p. 33.

The water, that has been well corked, as drawn from the pump, when cold ſtrikes ſome ſhades of a paliſh purple; but if ſuffered to cool in the open air it ſtrikes ſhades ſtill paler; if kept or ſent to any great diſtance, even though corked and ſealed up with the greateſt care, as it comes from the pump, it loſes its property of tinging with galls.

As it riſes from the ſpring it decompoſes ſoap, precipitates ſulphur from a ſolution of *hepar ſulphuris*; and if mixed with boiling milk, in the proportion of two parts of the water to one of the milk, and ſet on the fire till it acquires a boiling heat, it coagulates the milk as completely as moſt acids.

acids °. If poured on filings of iron, Dr. *Lucas* ſays, the proceſs of ſolution commences, and the water becomes a much ſtronger chalybeate; but he does not mention the quantity of iron they are capable of diſſolving: it corrodes all the iron works in and about the baths.

It does not affect the juice of tournſol; and immediately upon being mixed with ſyrup of violets it ſtrikes a ſea-green colour, which, in the ſpace of eight hours, improves by degrees to a beautiful bright graſs-green.

When mixed with the fixt or volatile alkaline ſalts, a ſlight ebullition and milkineſs of a yellow hue enſues, and it afterwards lets drop a precipitate of a white yellowiſh colour.

A ſolution of quickſilver, in the nitrous acid, dropt into it, occaſions a bright milky cloud, which growing ſuddenly opaque and precipitating, changes to a pale yellow, and if allowed to ſtand drops a precipitate of the colour of turpeth mineral, with a white and lighter one over it.

° It is in this way they make Bath poſſet and Bath whey: it likewiſe hardens and diſcolours fleſh and vegetables that are boiled in it.

A ſolution of ſilver, in the ſame acid, occaſions a blueiſh white cloud, which ſoon coagulates, appears opaque, and precipitates ſuddenly in grumes; the ſediment and particles yet ſuſpended, appear long white, but in eight hours have ſomewhat of a purple hue.

A ſolution of the corroſive ſublimate mercury cauſes no perceptible change for ſome time, but after eight hours gives ſome ſlight milkineſs, without any precipitation.

The heat of the water in the different baths is not exactly the ſame. The water of the King's bath, drawn from the pump in the pump-room, raiſed the quickſilver in Fahrenheit's thermometer to one hundred and nineteen; of the croſs bath to one hundred and fourteen; of the hot bath to one hundred and nineteen.

But the hotteſt ſource, in the King's bath, raiſed it to one hundred and twenty; in the croſs bath to one hundred and ſixteen; in the hot bath to one hundred and nineteen and a half.

The water of the King's bath, as it came from the pump, weighed a few grains in the pint lighter than diſtilled water; the water of the other baths a trifle heavier.

There is no vapour bath here as at Aix la Chapelle, and therefore Dr. *Lucas* had not an opportunity of collecting the condenſed vapour to try experiments with it; but in order to diſcover as much as poſſible of its nature, he filled a retort with the Bath water, and having fitted a receiver to it, he covered the lutings with paper ſtained blue with the juice of the tournſol, and diſtilled the water; after which, he found that the paper was ſlightly ſpotted red.

The water, which came over into the receiver, agreed in all ſenſible qualities with common diſtilled water, from the firſt to the laſt.

A gallon of the *King's bath* water was evaporated in an open glaſs; it emitted nothing ſenſible to the ſmell, from the begining to the end of the proceſs. As the vapour exhaled, the water loſt its pellucidity, became turbid, and an earthy pellicle appeared on its ſurface, which increaſed in thickneſs and in weight as the water diminiſhed, and at laſt it broke and fell to the bottom, and was ſucceſſively ſucceeded by others, which broke and ſunk in like manner till all the water was evaporated, when the glaſs was found coated from the upper ſurface of the water till near the bottom, where the cruſt was covered with ſmall ſaline ſpicula, whoſe chryſtals appeared like thoſe of Glauber ſalt. When only one ſixteenth part of the water remained, it appeared ſomewhat of the colour of French white wine, and heightened in its colour as the liquor diminiſhed, and being totally exhaled, left a circle of an oily appearance, and of a darker colour than in any other part of the glaſs. The reſiduum, when taken out and dried, weighed two drachms and fourteen grains; upon repetition of the experiment, the quantity of ſediment was ſometimes two or three grains leſs, and at other times three or four grains more.

A gallon of the *hot bath* water, treated in the ſame manner, yielded preciſely the ſame appearances and the like product; but often yielded a grain or a grain and a half, leſs in the pint.

And the croſs bath water evaporated in the ſame manner, exhibited ſimilar appearances;

ances; but yielded eight grains more of ſediment than the King's bath.

Thirty-three grains and a half of the reſiduum (being the ſolid contents of a quart of the King's bath water) were boiled repeated times in half an ounce of common diſtilled water, and filtrated whilſt hot, and this operation repeated till the water was quite inſipid; when the inſoluble matter left in the filtrating paper was well dried, it weighed thirteen grains and a half, which may be looked upon as the portion of earthy matter contained in this quantity of water.

The water with which the reſiduum was waſhed, being ſlowly evaporated to drineſs, ſhewed a yellowiſh oily circle, and left a white ſalt, weighing nineteen grains and a quarter; and as ſome of the ſalt was neceſſarily loſt in the proceſs, we may ſuppoſe the quantity to be about twenty grains.

Thirty-two grains of the reſiduum of the hot bath water (the ſolid contents of a quart) treated in the ſame manner, left twelve grains of inſoluble matter and twenty grains of ſaline.

Thirty-ſive grains of the *croſs bath* water (the ſolid contents of a quart) yielded ſixteen grains of inſoluble matter, and nineteen and a half of ſaline.

The inſoluble matter, of the water of each of theſe baths, cauſes ſome ebullition with all acids, and a ſmall portion diſſolves and blunts their acidity, but the greater part remains untouched; calcined in the fire, it gave the taſte and all the qualities of lime water, to common diſtilled water; and ſome ſmall portion of it was attracted by the load-ſtone.

To know more exactly the nature and compoſition of the inſoluble matter, ſix grains of it were thrown into half a drachm of diluted ſpirit of ſea ſalt; an ebullition enſued, and when this was over, more acid was added; but no further commotion enſuing, it was diluted with diſtilled water, and thrown into filtrating paper, when three grains and a half of an inſoluble earth were ſeparated, which Dr. *Lucas* knew to be lamellated chryſtals of the ſelenite; and there were two grains and a half of calcareous earth and iron diſſolved by the acid; but the quantity of iron in this water was but ſmall, not above $\frac{1}{37}$th or $\frac{1}{38}$th part of a grain in the pint, which the Doctor diſcovered by comparing the colour which the water ſtruck when an infuſion of galls was dropt into it, with the colour which different quantities of ſal martis diſſolved in a pint of diſtilled water gave. It was impoſſible to diſcover the proportion of iron in any other manner, the quantity is ſo ſmall; and the precipitate, the water drops in cooling, is not a pure ochre, but mixed with a fine earth.

The ſaline matter cauſes no ebullition with acids, and mixes with ſyrup of violets, without any change of colour.

Some drachms of this ſalt, being diſſolved in diſtilled water, evaporated and chryſtallized, yielded two ſorts of ſalt, ſo intimately united, as not to be eaſily ſeparated; the one in form of priſmatical chryſtals, which was a true Glauber ſalt; the other in form of cubical chryſtals, and was ſea ſalt. As near as Dr. *Lucas* could gueſs, from repeated chryſtallizations and other trials, about one third part was Glauber ſalt and two thirds ſea ſalt.

If in evaporating a ſolution of the ſaline matter, the chryſtals are ſeparated as formed, and the remaining liquor is evaporated to drineſs, one finds this laſt portion of ſaline matter, mixed with an oily matter that diſcolours it, but it has not bittern enough to make it grow moiſt.

From this account of the Bath waters we ſee, that they contain a mineral ſpirit and air, and an acid, which is partly in a volatile ſtate, and ſoon evaporates, though we cannot, by any means hitherto known, aſcertain the quantities of theſe volatile principles; the acid is certainly originally in ſufficient quantity to diſſolve and ſuſpend the different matters, with which the water is impregnated; but it is either more intimately united with the earthy and metallic principles, or is not ſo prevalent in the Bath water as in ſome of the cold ſpirituous chalybeates, for immediately on mixing it with ſyrup of violets, it ſtrikes a ſea green colour; whereas the Spaw waters, when mixed with the ſame ſyrup, as taken up from their ſprings, give evident marks of a prevalent acid, by ſtriking immediately a roſe purple or red, as we formerly mentioned.

From this account we learn likewiſe, that each gallon of the water of the King's bath contains about two drachms and fourteen grains of ſolid matter which is made up

Of iron about $\frac{8}{37}$ or $\frac{8}{38}$ parts of a grain.

Of Earths gr. liv.	Selenite	gr. $31\frac{1}{2}$	
	Calcareous	gr. $22\frac{1}{2}$	
Of Salts gr. lxxvii.	Glauber ſalts	gr. $25\frac{2}{3}$	between two and three grains of ſalt were loſt in performing the proceſſes.
	Sea ſalt	gr. $51\frac{1}{3}$	

All which is mixed with a ſmall portion of an oily matter, but not more than is common to all waters.

For a long time the Bath waters had been called ſulphureous, but they certainly never had any title to this name; they have no ſulphureous ſmell; they do not affect the colour of ſilver, or of other white metals put into them, and let remain for many hours, nor when expoſed to their vapour; nor do they produce any other effect of a ſulphureous water; and no ſulphur has ever been found ſublimed, or incruſted on the vaults of their ſources or conduits.

What was called Bath ſulphur we obſerved to be the alga or conſerva, a ſmall aquatic plant mentioned by *Guidot* as a moſs (muſcus) in his treatiſe *de Thermis Britannicis.*

The Bath guides, in order to keep up the notions of the waters being ſulphureous, and to gain a little money to themſelves, uſed to tinge ſhillings, and other pieces of ſilver, of a yellow colour by rubbing them with the mud of the baths mixed with ſtale urine; but Dr. *Guſtard*, in September 1752, informed me of this impoſition, which Dr. *Lucas* has ſince made publick.

The Bath waters operate powerfully by urine, and promote perſpiration; if drank quickly in large draughts they ſometimes purge; but if taken ſlowly, and in ſmall quantity, they rather incline one to coſtiveneſs, cauſe a ſenſe of heat, and oftentimes a heavineſs of the head, with a propenſity to ſleep, and particularly at firſt drinking them.

From what has been ſaid, it is evident, that they muſt be powerful correctors of putreſcent acrimony; at the ſame time that they are of ſuch a nature, as to give a briſk ſtimulus to the fibres and nerves.

Taken down into the ſtomach, they dilute and blunt whatever putreſcent humours they meet with; while their briſk, volatile, and chalybeate principles give a proper ſtimulus to increaſe the tone of the ſtomach and bowels, and to brace their fibres and nerves; and being taken up into the circulation, they pervade the minuteſt veſſels; they dilute, blunt, and correct thoſe fluids in the blood which are too putreſcent; at the ſame time that they increaſe the action of the whole vaſcular ſyſtem, to promote the circulation through the ſmalleſt veſſels, to break down groſs humours, to remove obſtructions, and to promote the ſecretions of the ſkin and kidneys for carrying off thoſe fluids that are unfit to circulate longer with the general maſs.

And hence they have been found ſo ſerviceable in ſuch a variety of diſorders.

In complaints of the ſtomach and bowels, which proceed from weakneſs and laxity, and from putreſcent humours lodged in their cavities; in pains of the ſtomach, attended with bad digeſtions; in that ſpecies of the heart-burn, which takes its riſe from choler, and other acrimonious juices lodged in the ſtomach; and in many cholicky and other diſorders of the bowels.

In diſeaſes which proceed from a too putreſcent ſtate of the blood, ariſing from living too long at ſea, or in the hot climates.

In gouty and rheumatic complaints, and in palſies.

In many hyſteric and hypochondriacal diſorders.

In ſome ſcrophulous caſes, where a penetrating, deobſtruent, and invigorating remedy is wanting.

In many female diſorders, ſuch as obſtructions of the menſes, barreneſs that proceeds from obſtruction and relaxation of the uterus, the *fluor albus*, *&c.*

And they have been found uſeful in variety of other complaints.

But however ſerviceable they may be in many caſes, there are others in which they are found to do hurt; for as they increaſe the animal heat, and brace the fibres, they have been found to be prejudicial in moſt caſes, where the blood is thick and ſizy, and there is much heat and fever, as in hectic fevers, ſuppurations of the the lungs, and other complaints of different kinds.

Bathing in theſe waters has likewiſe been found extremely ſerviceable in many caſes, where a ſoftening and relaxing application, that has at the ſame time a gentle ſtimulus, is wanted; and hence it has been found to aſſiſt greatly in removing many inveterate gouty and rheumatic complaints, and many chronic diſeaſes, and obſtinate obſtructions; in the cure of palſies, and many nervous diſorders; in removing cutaneous eruptions; and in the cure of variety of other diſorders.

And pumping the Bath waters on paralytic members, on ſprained, relaxed, and ſtiff joints, has on many occaſions reſtored the natural ſtrength, vigour, and motion to ſuch parts: and it has removed many pains, ſwellings, and obſtructions that had reſiſted the uſe of other remedies.

As Bath waters are of a heating nature, it is generally right, before beginning a courſe of them, to cool the body by living on a moderate, and rather low diet for ſome days, by emptying the firſt paſſages by means of a doſe or two of ſalts and manna, or ſome other cooling purge, and by taking away a little blood from thoſe who are plethoric, or hot and feveriſh.

Formerly theſe waters were drank in much larger quantities than at preſent, from one or two to eight or ten pints in the day; but of late years, they have been drank only from a few ounces to a pint or at moſt a pint and a half in the day. Both theſe extremes ought to be avoided; for if the large draughts that were formerly given ſometimes did miſchief, we certainly can expect but little benefit from ſuch a ſmall quantity as a few ounces in the day. In general the Bath waters may be drank from half a pint to two, three, or four pints in the day, according to the circumſtances of the patient; taking one, two, three, or four half-glaſſes at proper intervals, in the morning; a glaſs or two, an hour or two before dinner, and as much about the ſame time before ſupper.

During this courſe, the patient ought to live upon a light, eaſy digeſted diet, to uſe proper exerciſe, to go regularly to bed at ten or eleven o'clock at night, and to riſe early in the morning.

Soap and milk have been both recommended, and given with Bath water; but, as it curdles milk, and decompoſes ſoap, neither of them are proper to be taken along with it; though both of them may ſometimes be uſed during a courſe of theſe waters, if taken at a proper diſtance of time from the drinking of the water.

With regard to bathing, it ought to be obſerved, that the body ought to be cooled by a proper regimen and gentle evacuations previous to its uſe; for warm bathing rarefies and heats the blood, and is in danger of doing miſchief, if this precaution is not taken.

As there have been ſo many diſputes of late years concerning the nature of the Bath waters, and their uſes, I ſhall here ſubjoin an account of ſome experiments, which were made in preſence of ſeveral of the phyſicians at Bath, and which was given me by one of thoſe gentlemen in September 1752, when I was at Bath; and likewiſe ſome few obſervations of authors on theſe waters, which differ a little from what has been here advanced.

EXPERIMENTS made with Bath Waters.

Exp. 1. The Bath water, being pumped on Fahrenheit's thermometer, in the King's bath, for ſeveral minutes, the mercury roſe to one hundred and eleven.

Exp. 2. Three ounces of common water, heated to the ſame degree with the hot Bath water, were put into one glaſs, and three ounces of the recent Bath water into another, and we found by the thermometer, that they cooled equally for near an hour, but at laſt the Bath water retained one degree of heat more than the other; the Bath water raiſing the thermometer to forty degrees, the common water only to thirty-nine.

Exp. 3. Half a tea-ſpoonful of powdered galls, added to half a pint of Bath water, gave a brown muddy colour; but galls not powdered, but broke into pieces, gave the Bath water a fine purple colour, that was clear and not muddy.

Exp. 4. Ten drops of a ſolution of ſilver in aqua-fortis turned the Bath water white.

Exp. 5. Oil of vitriol, ol. ſulphuris per campanum, ſtrong ſpirit of nitre, ſpirit of ſea ſalt, were dropt ſucceſſively, the length of ten drops, into four different glaſſes of Bath water, but none of them made any alteration or efferveſcence.

Exp. 6. Twenty drops of ol. tartari per deliquium, mixed with Bath water, made it a little whitiſh, and precipitated a white powder.

Exp. 7. Five grains of ſaccharum ſaturni, mixed with Bath water, precipitated a powder more diſtinctly than it did with common water.

Exp. 8. Ten drops of ſpirit. c. cervi turned the Bath water a little more milky than it did common water.

Exp. 9. Ten drops of the ſpirit of urine gave the Bath water a milky colour.

Exp. 10. Five grains of ſal. tartari collected a large curd of a white colour, which gradually ſubſided: ſal. abſynthii produced the ſame effects, but in a ſhorter time.

Exp. 11. Bath water when cold was ſpecifically heavier than common water.

Exp. 12. We could perceive no difference in the refractive power between hot Bath water and common water.

Exp. 13. Syrup of violets, mixed with Bath water, made it of a yellowiſh green colour.

Exp. 14. Vitriolum martis made the Bath water of a higher colour than it did common water, and precipitated a reddiſh matter.

Exp. 15. Quickſilver diſſolved in aquafortis immediately curdled the Bath water, and made a precipitation.

Exp. 16. Quicklime, mixed with Bath water, precipitated a light flaky ſubſtance.

Exp. 17. Alum powdered made no alteration.

Exp. 18. Tinctura myrrh. mynſicht. made the Bath water of a cloudy milky colour,

lour, ſomewhat more ſo than it did common water.

Exp. 19. Mercur. ſublimat. corroſiv. mixed with Bath water, made no alteration, it only threw a little film on the top.

Exp. 20. Milk boiled, with an equal quantity of Bath water, for ſome time, at laſt curdled.

Exp. 21. Hard ſoap, beat up with the Bath water, after ſome time and with difficulty, lathered; but this lather reſembled what is produced from the beating up of cream, and it ſoon ſubſided.

Exp. 22. Five grains of logwood, in a glaſs of Bath of water, gave a much deeper purple colour than it did with common water.

Exp. 23. Silver, ſteeped three days in Bath water, and renewed freſh every day, did not alter its colour in the leaſt; but the Bath guides mix the mud of the Bath (which is of a ſtrong ſulphureous ſmell) with ſtale urine and Bath water, and this gives ſilver a yellow colour.

Exp. 24. Ten grains of Engliſh vitriol made the Bath water of a little more yellowiſh colour than it did common water, and there fell a yellowiſh ſediment to the bottom in about three hours, which did not happen to the mixture of the vitriol with common water.

Exp. 25. Syrup of violets only tinged diſtilled Bath water of its own proper colour.

Exp. 26. Silver diſſolved in aqua-fortis, and dropt into diſtilled Bath water, made no alteration.

EVAPORATED, and EXPERIMENTS with the Reſiduum.

Experiment 1. Two gallons of Bath water evaporated yielded four drachms of a whitiſh powder, in which there was one drachm of a fixed ſalt, a very little iron, and the reſt ſeemed to be a ſtony powder.

N. B. The loadſtone diſcovered ſome, though but few particles of iron in the reſiduum.

Experiments 2. Oil of vitriol, dropt upon the reſiduum, made very little or no efferveſcence; and gave a very little of the ſame ſmell as when dropt on the ſalts of Bath water.

Experiment 3. The reſiduum, put on a hot poker, gave no blue flame nor any ſulphureous ſmell, but ſparkled a little.

Experiment 4. Strong ſpirit of nitre, made a ſtrong effervefcence with the reſiduum.

EXPERIMENTS made on the SALTS procured by EVAPORATION and FILTRATION.

1ſt. This ſalt, mixed with oil of vitriol, gave a fume and ſmell, reſembling that which riſes when this acid is dropt on ſea ſalt.

2d. Mixed with ſpirit nitri-fortis, it made no ſenſible alteration.

3d. Put on a red-hot poker it decrepitated and a little of it melted.

N. B. The ſand, nut-ſhells, peach-ſtones, &c. which are found in the bottom of the baths, are all of a black colour.

EXPERIMENTS and OBSERVATIONS of Authors.

Mr. *Howard* [a], on three different days, tried the temperature of the Bath waters, in November and December 1765, with a thermometer made by Mr. *Bird*, by *Fahrenheit*'s ſcale, and found that the water of the *King's bath pump* raiſed it to one hundred and thirteen; of the *hot bath pump*, to one hundred and fourteen; of the *croſs bath pump*, to one hundred and eight.

Of the *hotteſt part of the King's bath*, to one hundred and three; of the *cooleſt part*, to ninety-ſeven.

Of the *hotteſt part of the Queen's bath*, to ninety-nine; of the *cooleſt part*, to ninety-five; of *the pump* in the bath, to one hundred and thirteen.

Of the *hotteſt part of the croſs bath*, to ninety; of the *cooleſt part*, to eighty-nine; of its pump, to one hundred and ſeven.

Dr. *Rutty* (p. 595) obſerves, that with oil of vitriol and other acids, the Bath waters do excite ſome inteſtine motion, and greatly ſheath or deſtroy the acidity.

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[a] Phil. Tranſ. vol. 57, page 201.

Dr. *Charlton* ſays, that when Bath waters have loſt their tinging properties, they often recover it again, after they have undergone a thorough fermentation; and that the *King's bath* tinges doubly ſtronger with equal parts of galls, to what the *hot* or *croſs baths* do; and that fifty or ſixty gallons of the water evaporated till near three or four pints, is of a colour like mountain wine, and ſmells of balſam of Tolu; and that the reſiduum rubbed with ſalt of tartar, gives a golden tincture to ſpirit of wine; from whence he would infer that it contains ſulphur.

Dr. *Hillary* got from a gallon of the water of the *King's bath* one hundred and fifty-five grains of ſediment; of the *hot bath* one hundred and thirty-nine grains; of the *croſs bath* one hundred and thirty grains. Dr. *Rutty* tells us, that this reſiduum conſiſts of above a double quantity of a calcareous and argillaceous matter to the ſaline, and that the quantity of ſalts ſcarce exceeds forty grains in each gallon, and the reſt of the matter is a grit and a blue ſulphureous earth, or marl, according to Dr. *Hales*, who, from a hogſhead, got ten ounces, five drachms and a half of ſediment.

Dr. *Rutty* ſays, that an effect common to thoſe with other baths is, to throw out a redneſs and aſperity on the ſkin, like an itch, which ſoon diſappears by their continued uſe; and he tells us, that Dr. *Randal* ſays, that they have been obſerved, though rarely, to have paſſed off by ſpitting; and he obſerves, that they have been recommended for the cure of the dry leproſy and of other cutaneous diſorders; but thinks that many of the cold ſulphureous waters are preferable to them.

Bathing in the Bath waters during a fit of the gout, is apt either to evaporate or to repel the gout; and therefore is not ſo proper at this time; but after the fit is over, it is of uſe to ſtrengthen the parts and to remove any remaining obſtructions.

MATLOCK,

In the county of DERBY, ten miles north of the town of DERBY, on the road to CHATSWORTH, are ſituated the warm baths of MATLOCK, on the eaſt ſide of a high hill, at the foot whereof flows the river Derwent.

There are ſeveral ſprings of warm water at this place, all of them riſe from between fifteen and thirty yards above the level of the river; for either higher or lower, the ſprings are cold; ſo that the materials warming and impregnating theſe waters, lie in that height; and from experiments made with the mineral ſubſtances, through which the waters run, Dr. *Short* alledges, that they certainly acquire their heat by paſſing through a bed of *Limeſtone*, and another ſort of ſtone, which he calls *Croilſtone*.

The Doctor ſays, that the diſtance from the moſt northerly to the moſt ſoutherly of theſe warm ſprings, is about five hundred and ſeventy yards, and they lie in the following order.

From the warm ſpring behind the ſtable to the bath, is about one hundred and eighty yards; from the bath to the firſt of the warm well ſprings, about four hundred yards; from that to the ſecond, ſix yards; from this to the third, ſixty-four yards; from the ſecond, to another warm ſpring lying ſouth-weſt or rather weſt, in the next cloſe but one to the road, twenty yards; and about twenty yards north, at the back of the kitchen, is a warm ſpring, which ſupplies the houſe with water. Beſides thoſe here mentioned, there are ſeveral ſmall rills or ſprings which riſe within this ſpace

And about half a mile ſouth-weſt, on the ſouth ſide of the hill, there is a prodigious quantity of warm water thrown out of the old lead works, which go by the name of the *Ball's-eye.*

All along the courſe of the warm waters, from their firſt eruption down to the river, are the greateſt heaps and moſt ſurpriſingly large petrefactions to be found in any place of Great Britain; they are ſo ſoft before they are expoſed to the open air, that you may eaſily crumble them to pieces with your fingers, and are very light; but afterwards they turn of a ſmoaky blue colour, and become very hard; ſo that the neighbouring people top their chimneys, make fences, and build vaults or arches with them at very little charge: any ſtrong acid dropt upon them raiſes a great fermentation, hiſſing, and boiling up with a ſulphureous ſmell, and ſmoak, and turns them to a jelly.

All the warm waters which exſude from the roof or arches of ſundry ſmall grottoes hereabout, form little pillars or priſms of various different ſhapes; but the warm waters above ground form another ſort of petrefactions by incruſtation at firſt, but afterwards they totally conſume or deſtroy the body on which they gather, and aſſume its genuine perfect ſhape, ſuch as that of moſs of ſeveral kinds of leaves of trees, pieces of wood, &c. Dr. *Short* ſays, they are the fineſt petrefactions he ever met with.

The water of the Bath and of all the other tepid ſprings is exceeding clear; it has no ſteam, except in cold weather; nor does it throw up great bubbles of air, as the Buxton water does.

The ſpirits of a thermometer (ſixteen inches long, whoſe bore was one twenty-third part of an inch) which ſtood in the river Derwent, at one inch ſeven eighths; when removed from thence, and let ſtand for half an hour in the bath, roſe to four inches and two eighths. And in the table of the temperatures of ſeveral baths, which Dr. *Short* has given, in page two hundred and ninety-eight of his ſecond quarto volume, on mineral waters, he ſays, the heat of the Briſtol water is to that of Matlock, as fifty-two to forty-five: if, therefore, this proportion is juſt; and if the Briſtol waters raiſed the quickſilver in Fahrenheit's thermometer to eighty-three, as Dr. *Lucas* alledges, the Matlock water will raiſe it to ſeventy-one and $\frac{43}{52}$ But if the Briſtol water only raiſes the quickſilver to ſeventy-ſix, as others affirm, then the Matlock water will only raiſe it to ſixty-five and $\frac{10}{13}$.

The Matlock water is about a drachm in the pint lighter than common water.

With ſyrup of violets it firſt became blueiſh, then greeniſh, and after ſtanding ſome days was entirely green; with tincture of rhubarb, it became of a reddiſh yellow; and with tincture of galls, in one trial, it ſtruck a muddy green; but in another, it became of a fine purple, which gradually went off again as the tincture diffuſed itſelf; and being let ſtand all night, it was next morning of a ſack colour at the bottom, with a purple ſcum at top, and blue for half an inch under it; and after ſtanding four days it was green.

Spirits of vitriol occaſioned a ſtrong commotion, with much bubbling, and left the water exceeding clear, and the ſides of the glaſs covered with air bubbles: both fixed and volatile alkalies made it turbid and milky, and it lets drop a white ſediment. When taken immediately up from the fountain, it curdled ſoap; but incorporated ſmoothly with it, after ſtanding expoſed to the air for two or three days. It mixed ſmoothly, and boiled well with milk.

It curdled with a ſolution of ſilver in the nitrous acid, and let fall a ſediment, which was white below and purpliſh above; it became milky with a ſolution of ſaccharum ſaturni, and let drop a ſediment.

Six pints and a half of the water, when evaporated, left twenty-eight grains of an exceeding white ſediment in one experiment, and eight pints and a half left forty in another.

Theſe ſediments fermented violently with acids, and turned ſyrup of violets green.

Of the forty grains obtained in the laſt experiment, thirteen grains were ſalt, the reſt an alkaline earth.

The earth (by all trials) proved to be of the calcareous kind, and when calcined, ſome particles of it were attracted by the loadſtone, which ſhewed that it contained a pittance of ochre.

The ſalt, when laid on a red-hot iron crackled, ſwelled, and blebbed a little, and when diſſolved and chryſtallized projected chryſtals of calcareous Glauber ſalt and ſea ſalt; but the chryſtals of the firſt were in greateſt plenty.

The waters of the other ſprings are entirely of the ſame nature.

From this account of the Matlock water we ſee, that it is tepid, but is not ſo highly impregnated with a mineral ſpirit, as ſome other waters; though from the experiments with ſoap, it ſhould ſeem to contain an acid that is partly in a volatile ſtate; and it contains alſo a very little of a chalybeate principle; and the ſolid contents, obtained by evaporation, are in but very ſmall quantity, not above thirty-ſix grains in the gallon, and of this near thirteen grains are a ſalt, compounded of a calcareous Glauber and ſea ſalt, and about twenty-three grains a calcareous earth; ſo that we can attribute but little of the virtues of this water to the ſmall quantity of groſs ſolid matter.

It has been drank, and recommended in moſt of the caſes for which the Briſtol water has been preſcribed; though this gives ſlight marks of a chalybeate impregnation which the other does not. It is ordered in rheumatiſms, hectic fevers, in the hæmoptoe and other hæmorrhages, in the diabetes, in the fluor albus and in gleets, in ulcers of the kidneys and bladder, and other internal ulcers, in the ſcrophula, and variety of other diſorders.

And the baths have been uſed both in rheumatic and other pains, in cutaneous diſorders, and in other caſes where tepid baths have been preſcribed.

Dr. *Short* mentions ſeveral other warm ſprings of the ſame kind of water that have been obſerved in this county, at a few miles diſtance from Matlock; ſuch as *Middleton baths*, which are two miles ſouth-weſt of Matlock. The two *warm brooks* at Wirkſworth, which are two miles from Middleton, and come out from lead mines; but as they carry ſmall particles of lead with them, they are not fit for internal uſe. The warm bath at *Stony Middleton*, which is nine miles from Matlock, and ſupplied by a very plentiful ſpring.

GERMAN WATERS.

NIDERBRON,

A village in ALSACE, ſituated on the eaſt ſide of mountains called VOGESI, which divide ALSACE from LORAIN.

Near to it is a tepid chalybeate water, which has been particularly deſcribed by Dr. J. Lud. Leuchſenring [p]; and in the fourth volume of the *Comment. de Reb. geſtis in Medicina & Philoſophia Naturali, p.* 117, we have an abſtract of his account.

The Niderbron water is clear, and taken up in a glaſs it diſcharges a great quantity of air bubbles; its ſmell reſembles that of water, in which vitriol and common ſalt have been diſſolved, after it has ſtood for ſome time; and its taſte is evidently ſaltiſh, and has nothing vinous in it.

It is rather heavier than diſtilled water, it is tepid, and raiſes the quickſilver to ſixty-three degrees.

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[p] Diſſertat. med. inag. de fonte medicato Niderbronnenſi. *Auctore Jo. Ludovic Leuchſenring*, edit. Argentorati 4 Mai 1753.

It ſtrikes a blackiſh colour with galls; it curdles ſoap, and precipitates ſulphur from a ſolution of hepar ſulphuris in water; it precipitates mercury, diſſolved in ſpirit of nitre, in form of a yellow powder; and ſilver diſſolved in the ſame acid, in form of a white powder, which is difficult afterwards to fuſe by the force of fire; and and hence he concludes that it contains both the marine and the vitriolic acid.

Evaporated in a retort, ſeventy-five pounds left four ounces, a drachm and a half of ſolid matter, or $\frac{1}{215}$th part of the whole, which is in the proportion of 285 grains to the gallon.

This ſediment, when expoſed to the open air, became moiſt; and when put into a retort, and expoſed to a ſtrong heat, it yielded two drachms and a half of an acid liquor, which Dr. Leuchſenring ſays, he knew to be a volatile vitriolic acid.

By waſhing and lixiviating the remainder in diſtilled water, and then filtrating and evaporating the liquor that paſſed through the filtrating paper, he got three ounces, two drachms and a half of common ſalt, and two ſcruples of Glauber ſalt.

And the inſoluble matter, which remained in the filtre, weighed one drachm and fifty-nine grains, or was $\frac{1}{3926}$th part of the whole; which is in the proportion of near ſixteen grains to the gallon of water, being above fifteen grains $\frac{6}{7}$. This earth, he ſays, he found to be partly vitreſcible, and partly an aluminous earth, and mixed with an oily matter, or blackiſh petroleum; for he obſerves, that in the veſſel in which he performed the chryſtallization of the alum, he diſcovered a black petroleum: he ſeems to think, that if chymiſts examined more carefully the earths of mineral waters, which effervеſced with acids, that they would often diſcover an aluminous earth and bitumen.

This laſt fact deſerves to be attended to by chymiſts who hereafter analyſe waters; for we formerly obſerved, that alum has hitherto been found in but very few mineral waters that have been examined by late accurate obſervators, though it was formerly ſaid to exiſt in many.

This water may be uſed for the ſame purpoſes as the cold waters of the ſame claſs, and which contain nearly the ſame quantity of ſea ſalt, and it may likewiſe be uſed as a tepid bath.

Mr. *Buſching* in his new ſyſtem of geography [q] mentions four other baths which are in this country, but gives no deſcription of them; the firſt at Watweiler; ſecond not far from Benfeld; third at Sulz; and fourth near Melzhein.

WISBAD,

Situated in the circle of the UPPER RHINE, five German miles north of the town of MENTZ.

The hot waters at this place were known to *Tacitus*. Dr. *Hoffman* ſays, they are chalybeates, and throw up plentifully of ochre, ſo as to cover the ſides and confines of the ſpring with a thick yellow cruſt; they make a ſmall efferveſcence with acids; and oleum tartari per deliquium makes them turbid and white.

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[q] See Engliſh tranſlat. vol. ii. page 592.

Two medical pounds, evaporated, left half a drachm of ſolid matter, which ſeemed to approach to the nature of common ſalt, both by its crackling on the fire, and raiſing a white pungent vapour with oil of vitriol; from whence Dr. *Hoffman* infers that theſe waters, beſides an alkaline principle, contain alſo ſome portion of common ſalt, to which their purgative virtue is owing.

Formerly, he ſays, theſe waters were only employed externally as baths, but of late years have been found eminently ſerviceable in many caſes when uſed internally.

ITALIAN.

AOSTA,

The waters called Aquæ Augustanæ, are ſituated in the duchy of Aosta, in the northern part of Piedmont, near to Curia Major, which is about ſixteen miles from the town of Aosta.

There are two ſprings, the one is called Victoria, the other Margarita, which are both deſcribed by Dr. *Fantonus* [r]. The water of the *Victoria*, as taken up freſh from the fountain, is tepid and limpid, and has a ſaltiſh acidulous taſte, and a ſmell which affects the noſtrils; it ſtrikes a crimſon colour with tincture of heliotropium, and even retains that property in part, after being carried to a diſtance; and it gives a violet colour with galls, though not after it has been kept.

It covers the bottom of its well, and of the channels through which it runs, with a browniſh ochre, and if kept long in ſtone or wooden veſſels, it depoſites to the ſides and bottom, a number of thin white porous cruſts, which have little or no ſharp taſte, and are gritty when broke with the teeth. A pound of this water evaporated, yielded a ſcruple of ſediment, which is in the proportion of two hundred and forty grains from the gallon, of which one ſixth part is a ſalt that eaſily runs per deliquium in the air, and cauſes a white cloud in the watery ſolutions of ſublimate mercury, of ſaccharum ſaturni, and of ſilver; the reſt of the ſediment is an earth which ferments with acids.

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[r] See Jo. Fantoni comment. de quibuſdam aquis medicatis, and diſſertat. de febrib. miliariis, *Auguſtæ Taurinorum* 1747.

The water of the *Margarita* fountain is pellucid and warm; and, when taken up immediately from the fountain, Dr. *Fontanus* ſays, he has been aſſured, it gave marks of its containing an acid ſalt, by its ſtriking a red colour when mixed with powdered heliotropium, and of its being a chalybeate, by the addition of galls, though it gave no ſign of theſe impregnations, after it has been carried to a diſtance, or kept for any time.

It drops a ſoft ochreous coloured ſediment in its well, and in its wooden channels near it, which gradually becomes leſs coloured, and firmer as it is at a greater diſtance from the ſpring; this ſediment is compoſed of an ochre and an earth; the earthy part is affected by acids, but the ochre not.

Evaporated, it left about one third leſs ſediment than the waters of the Victoria, and the elixated ſalt was leſs ſharp; the earth ſeparated from the ſalt, after being waſhed, was inſipid, and fermented with diſtilled vinegar and with ſpirit of vitriol.

CHAP. III.

OF HOT CHALYBEATE WATERS, WHICH CONTAIN A CALCAREOUS GLAUBER SALT.

ALTHOUGH, in treating of cold chalybeate waters, we mentioned a great number which contained a calcareous Glauber ſalt in conſiderable quantity; yet I have not hitherto met with an accurate account of any hot water in which this ſalt has been found in large quantity; though it is more than probable, that many of thoſe mentioned by *Baccius* as containing nitre, and iron, and other minerals will, when accurately examined, be found to be ſuch as ſhould be brought into this claſs of waters.

ITALIAN.

PISA.

GROTTO OF VITERBO.

ASTRACHAN.

ST. PETERS.

WALLACHIA.

BATHS OF HERCULES.

ITALIAN.

BATHS OF PISA.

There are two places in the country of Piſa where there are warm baths, which have been in great repute, *viz.* 1. The baths of the waters; 2. And of mount St. Julian. *Fallopius* gives the following account of them.

1ſt. The bath of the waters, or *Bagno a acqua*, is ſituated about ſeventeen miles from Piſa, in a pleaſant valley; the water is tepid and fills two baths, the one for the men, the other for the women; the firſt is only covered in part, the other totally. The water is only uſed as a bath, and people ſtay three, four, or five hours at a time in it: it has been ſaid to be variouſly impregnated by different authors; but he thinks it is quite a pure ſimple water.

2d. The baths of mount St. Julian, or *Bagni di Monte St. Juliano*, are ſituated at the bottom of the hill of St. Julian: there are four baths here, three of which are become obſolete; but the fourth, the *bath of the queen*, is uſed both for drinking and by way of a bath: it is covered, and ſaid to be impregnated both with iron and alum, but he could find no marks of iron in it, though he thought it was more ſtrongly impregnated with alum than the bath of villa. What *Fallopius* thought to be alum, has ſince been found to be a calcarious Glauber ſalt.

This bath, he ſays, is much uſed in the leproſy, and he found it very ſerviceable in ſuch caſes. Two miles from this is the cold bath of Agnano, the water of which is very cold, and ſaid to be impregnated with marble.

Since *Fallopius*'s time we have had ſeveral more accurate accounts of the contents of theſe baths, three of which I ſhall take notice of; the one by Dr. *Zambeccari*[s], the ſecond by Dr. *Cocchi*, and the third by Dr. *Giovani Bianchi*.

Dr. *Zambeccari* ſays, the *bath of the waters* is ſituated ſixteen miles from Piſa.

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[t] Vide Baccius de thermis, edit. *Patavis* 1711. addit. ſeulib. viii.

The water of this bath is perfectly clear and inſipid, occaſioning no nauſea when drank. It raiſed a thermometer, which had a ſcale of fifty degrees, to thirty-ſix, which was nearly equal to the human heat; mixed with a ſolution of corroſive ſublimate, or oleum tartari per deliquium it became milky, as it did likewiſe when diſtilled in leaden veſſels.

Evaporated in glaſs veſſels, a pound of the water left a drachm of ſediment, which adhered to the bottom and ſides of the veſſel, in form of very fine thin chryſtalline like filaments. Before this ſediment is perfectly dry, it has a ſharp ſalt taſte, which it loſes very ſoon, and becomes inſipid; it effervеſces with oil of vitriol; diſſolved in vitriol water it changes the clear green colour into a turbid yellow; and mixed with tincture of galls it gives an obſcure green, and drops a gypſeous ſediment; waſhed till it becomes quite inſipid, it differs in nothing from gypſum mixed with ſome fine filaments of talc, and the water in which it was waſhed (being evaporated) yielded cubic chryſtals of ſea ſalt, and hexagonal chryſtals of nitre, *viz.* calcarcous Glauber, which had a cool taſte.

The water ſtains linen of a yellow ruſty colour, in the ſame way as vitriol water, and lets drop a ſediment of the ſame kind on the ſtones in the bottom of the bath, and there gathers on the walls of the bath, at the ſurface of the water, a ſubſtance of the colour of vitriol, which has an auſtere ſtyptic taſte, and the water drops an unctuous ſubſtance on the ground it runs over, which makes it very ſlippery under foot at ſuch places.

From all which Dr. *Zambeccari* concludes, that theſe waters are impregnated with ſea ſalt, nitre, or calcareous Glauber, talc, and gypſum, or a white earth, and and likewiſe with vitriol; and as the ſalt burns much, when put on a red-hot iron, he ſuſpects that they contain either a portion of ſulphur, or ſome petroleum, or bitumenous matter, which he thinks confirmed by the waters acquiring a ſulphureous ſmell, by putrefaction, and by the unctuous matter, or ſludge which they let fall.

THE BATHS OF MOUNT ST. JULIAN,

Are ſituated at the bottom of the hill.

There are ten different ſprings of warm water here, which are received into baſons or channels, and differ principally from one another in the degree of heat and quantity of their waters. The ten are,

* Farn.

1. The *little bath* (bagnetto) the water of which raiſed the thermometer of 50 degrees to 37 = $98\frac{2}{3}$.
2. The *hot bath* (bagno caldo) which raiſed it to 39 = 104.
3. The large bath (bagno grande) which raiſed it to 37 = $98\frac{2}{3}$.
4. The bath of the ſmall well of the great bath called (bagno del pozzetto de bagno grande) which raiſed it to —— 37 = $98\frac{2}{3}$.
5. and 6. The pumps or falls (bagni della doccia) the one for men, the other for women, which raiſed it to —— 36 = 96
7. The queen's bath (bagno della regina) which raiſed it to —— —— 40 = $106\frac{2}{3}$.
8. The fountain of the bath, which raiſed it to 37 = $98\frac{2}{3}$
9. The bath of the nerves, which raiſed it to 34 = $91\frac{4}{9}$
10. The bath ad tineam, which raiſed it to 36 = 96

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* This computation was made upon a ſuppoſition that the ſcale of Dr. *Zambeccari*'s thermometer begun at the ſame point as Fahrenheit's, but if it begun only at the freezing points, then the degrees are as follows,

37 = $97\frac{7}{9}$ 40 = $103\frac{1}{9}$
39 = [illegible]01 $\frac{1}{3}$ 36 = 96
34 = $92\frac{4}{9}$

The[illegible]

Theſe waters (when held in the mouth) have no taſte, nor do they excite a nauſea; and they have a ſlight ſmell of ſulphur, and the water of the queen's bath tinges ſilver of a yellow colour.

The ſolid contents of theſe waters are all much of the ſame nature, though different a little in quantity; for a pound of the water of the little bath yielded only between twenty-ſeven and twenty-eight grains, while a pound of the water of the well of the great bath yielded a drachm.

They contain no ochre (rubricam) or talc, otherwiſe they agree with the waters of the bath of the waters (bagno a acqua) for they are impregnated with common ſalt, nitre, bitumen, ſulphur, and vitriol, which laſt, however, I think may be doubted, as he ſays galls made no change upon them.

In the year one thouſand ſeven hundred and forty-two the ſprings and baths of St. Julian, which were before open, were covered with two large piles of buildings which now go by the name of the *eaſt* and *weſt* baths, and in each of theſe are a number of baths, and different apartments made for the convenience of the bathers.

Dr. *Antonius Cocchi*[u] in the year 1750, publiſhed a particular treatiſe on theſe waters. He ſays, their colour is ſo extremely limpid and clear, that the minuteſt objects may be ſeen at the bottom of their baſons, when recently filled, and that they preſerve their tranſparency long in well ſtopt bottles, though if expoſed to the air they ſoon become like common water.

They have no ſenſible ſmell, notwithſtanding that their vapour in the baths ſometimes produces a ſlight, but not a diſagreeable titillation on the organs of ſmelling, and ſometimes occaſions a heavineſs or ſlight head-ach which goes off with bathing. In wet weather, ſome people have imagined that they have felt a ſlight ſulphureous ſmell, particularly if they ſtirred the waters in the baths; but this the Doctor imagines was occaſioned either by the ſlight corruption of ſome animal or vegetable ſubſtance; or to the ſeparation of ſome of their natural air, mixed with ſome fine volatile oily particles.

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[u] See Trattato dei Bagni, di Piſa, di *Antonio Cocchi*, in Firenze, 1750, 4to.

Their taſte at their fountains or ſprings does not appear to be much different from that of common water, made of the ſame degree of heat; though he thinks that they have a little roughneſs, which cannot be diſtinguiſhed when they become cold, from whence he judges, that it has been occaſioned by a mineral ſpirit, which evaporates as the waters grow cold.

The heat of theſe waters raiſed the quickſilver in one of Monſr. *Reaumeur*'s thermometers to the following heights.

	Reaum. Deg.		Fahrn. Deg.
East Baths.			
In the great Eaſt Spring to	32	=	104
In the Well which is drank	39	=	99½
In the Baths	from 27 to 29	=	92¾ to 97¼
Weſt Baths.			
In the Weſt Baths of Venus	27	=	92¾
In one of the Wells	31	=	101¾
In the Bath of Mars	27	=	92¾
——— of the Nerves	27	=	92¾

He found by many trials, that theſe waters were about one grain heavier in the cubic inch, than the water of the fountain of Piſa; and that they themſelves became one grain ſpecifically heavier by cooling, than they were when taken freſh up from the fountain.

They changed the ſyrup of violets to a green colour.

The powder, decoction, and infuſion of galls mixed with ſeparate parcels of theſe waters, gave them the ſame greeniſh colour as they did to common water; nor could the leaſt ſhade of red, purple, or black be perceived, when the waters were mixed either hot from their ſprings, or after they had become cold; when added to a vitriolic water mixed with galls, they ſeemed to reſtrain the tinge and rendered the mixture of a whitiſh mixed with a roſe colour. The powder of galls, though it ſtruck no ſhade of red, yet it brought a variegated oily ſcum to the ſurface.

Pomgrenate bark, tea, and rhubarb gave their natural colour to theſe waters.

Milk mixed with rennet and thermal waters, and ſet on the fire to boil, roſe later than with common water, it curdled only in part, and the reſt remained a confuſed maſs; but with common water it ſeparated into a curd and whey.

Meat

Meat infuſed in theſe waters became whiter, and this infuſion ſeemed rather to haſten than to retard its putrefaction.

Theſe waters ruſt iron much ſooner than moſt others; they do not diſſolve it, but precipitate it to the bottom, in form of a ruſt or powder.

They do not change the colour of gold, or of ſilver put into their ſprings, and let remain four hours; nor do they affect copper more than common water.

Each drop of a ſolution of ſilver in ſpirit of nitre occaſioned a whiteneſs in the water, but did not give the leaſt appearance of blackneſs as when dropt into a ſulphureous water.

Each drop of a ſolution of lead in vinegar makes it milky; it drops a white precipitate, and ſome white clouds remain ſuſpended.

Common ſalt gives a ſmall degree of whiteneſs, which it does not do in common water.

They become a little white above with a ſolution of alum.

Spirit of vitriol gives a ſlight ebullition with theſe waters, both as taken freſh up from their ſprings and after they have become cold; but aqua-fortis only gives a ſlight inteſtine motion.

From theſe and a number of other experiments, he ſays, he could diſcover nothing more of the nature of theſe waters, than that they contained a ſmall quantity of earth and a much leſs quantity of ſalt, which is of an alcaline nature.

When they ſtand in the baths, there gathers an earthy pellicle on their ſurface, and if they ſtagnate long, this pellicle often becomes of a green colour, from ſmall aquatic plants of the conſerva kind riſing to their ſurface.

This earthy pellicle begins to be formed ſoon after the waters are diſcharged from their ſprings, and at firſt it appears in form of fine particles of white or aſh coloured earth ſwimming a top of the baths, which unite into little flocculi; theſe precipitate and form an earthy cruſt on the ſides and bottom of the baths.

They depoſite likewiſe another ſort of earth, which forms a granulated cruſtation, which ſeems to be made up of a number of minute, white, hard, and rough globules.

Theſe waters, by ſtagnating, loſe their mineral ſpirit and heat, and diſcharge a quantity of air bubbles.

Evaporated in balneo Mariæ, he got about twenty-ſix grains of ſolid matter, compoſed of earth and ſalt, from the pound.

The earth was of three different kinds, the two firſt ſeparate ſpontaneouſly from the waters; the firſt is the fine earth which ſwims a top, and afterwards precipitates; the ſecond is that which precipitates and forms the firm hard granulated cruſt; the third is more firmly united with the waters, and is only to be got by evaporating them, or by mixing an alcaline ſalt, or ſome other ſubſtance which has a greater affinity with the acid that ſuſpends the earth, than the earth itſelf; he ſays, this laſt earth is of a cretaceous nature, and ſeems to contain a number of ſmall priſms, which approach in their appearance to the chryſtals of ſalts, and that it makes up about two thirds of the whole ſolid matter got by evaporation.

Theſe earths ferment with acids, but alkalies produce no change on them; put in a crucible and ſet over the fire, they neither ſwell nor crackle, and they give no marks of their containing iron by the application of the loadſtone.

The ſalt, he ſays, is not to be diſcovered by the taſte in the freſh waters; but manifeſts itſelf by its bitter taſte, when a large quantity of water is reduced to a few ounces: by waſhing the ſediment, left after evaporation, with water, and then evaporating, he procured the ſalt, which appeared in form of very ſmall flocculi mixed with earth; and on examining the chryſtals with a microſcope, they appeared to be compoſed of ſix rectangular plains or ſides, four of which were long and ſtraight and the two at the extremities ſquares. By repeated ſolutions, and chryſtallizations, they approached in their appearance to that of fixt alcaline ſalts, and on trial ſeemed to be of that nature, for they fermented with oil of vitriol, but not with oleum tartari per deliquium, and they produced the ſame change of colour on vegetable infuſions as alcaline ſalts; put on the red-hot coals, they neither ſwelled, burnt, nor crackled, and they excited no ſmell; they attracted moiſture from the air, and became fluid, and they whitened a ſolution of ſilver. He ſuſpects that they are made up of a mixture of the foſſil alcali and ſea ſalt: the ſalts make about one fourth of the ſolid contents of the water, and are in about the proportion of one to three of the earths.

Theſe waters, if drank in large and often repeated draughts, the length of ſeven or eight pounds, commonly operate by ſtool, and for the moſt part they paſs off freely by urine.

Dr. *Bianchi*[x] gives the following account of them, which was publiſhed in the year 1757, and differs in ſome particulars from that of Dr. *Cocchi.*

In the *eaſt building* a number of ſprings diſcharge a large quantity of water, principally into two large ciſterns, which ſupply ten baths, and five pumps, or falls of water; and eight of the baths have been called by the names of heathen gods and goddeſſes, *viz. Jove* or *Jupiter*, *Juno*, *Neptune*, *Mars*, *Apollo*, *Diana*, *Mercury* and *Ceres*.

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[x] See *Trattat. dei Bagni de Piſa,* de Dr. *Giovanni Bianchi,* publiſhed at Florence, 1757.

In the *weſt buildings*, there are likewiſe a number of baths, and douches or pumps; the two moſt remarkable are the *bath of the queen* and the *bath of the nerves*.

The heat of the water of the great ciſtern, in the *eaſt baths*, raiſed *Fahrenheit*'s thermometer to one hundred and ſix, and of the other ciſtern to one hundred and five; and the water of the well near to *Neptune*'s bath, which is the water commonly drank and uſed for the pumps, raiſed it to one hundred and three.

The waters, when conveyed into the baths, ſeldom raiſe the thermometer to above one hundred or one hundred and one. And the men ſeldom chuſe to go into the bath, when the heat raiſes the thermometer above ninety-ſeven or ninety-eight, and the ladies when it raiſes it above ninety-three and ninety-four.

The heat of the water in the *weſt baths* is not ſo great as that of the eaſt. The water of the ſpring of the *bath of the nerves* raiſing the thermometer only to one hundred and four, and of the ſpring of the queen's bath to one hundred, and in the bath to ninety-five and ninety-ſix. The waters of the other baths are principally ſupplied with pipes from the *eaſt bath*.

The waters of the baths at Piſa are limpid, as they riſe from their ſprings, and contain a mineral ſpirit: but when they ſtand long in the baths, they throw up a white calcareous ſcum, or cruſt, to the ſurface, which from time to time precipitates, and forms a cruſt in the bottom of the baths. In the bath of Neptune, this ſcum becomes in time ſo thick and ſtrong, that it is able to bear a ſparrow or a thruſh, before it precipitates to the bottom of the bath.

By evaporating eight pounds (a gallon) of each of the following waters, he obtained the following quantities of calcareous matter and of a bitter ſalt, reſembling the Epſom.

	Cal. mat.	Bitter ſalt.
Eight pounds of the water of the well of Neptune's bath yielded	89⅓ gr.	22⅔ gr.
Eight pounds of the great ciſtern	75⅓	14⅔
———— of the Queen's bath	69	7⅓
———— of the Bagnaccio	48	6

Hence we ſee, that theſe accounts of Dr. *Cocchi* and Dr. *Bianchi* differ principally in the degree of heat, the quantity of ſolid matter, and the nature of the ſalts aſſigned to theſe waters; but it is evident from both, that they are not chalybeates, that they are of a temperate degree of heat, and contain but very little ſolid matter, and that they are of a very mild nature; and that they would have been more properly ranked among the ſaline waters than here.

OF THE GROTTO AT VITERBO.

A mile from Viterbo, in the Siena, is a grotto where there is a warm chalybeate water, which *Baccius* calls nitrous and copperiſh; it is limpid, has no ſmell, but its taſte is not agreeable to every one; by keeping and carriage it loſes a great deal of its virtue: it operates by ſtool and by urine. It is eſteemed an invigorating water, and been uſed in palſies, and for reſtoring weak conſtitutions, and in other complaints; it is both drank and uſed as a bath.

From this account of *Baccius* it is moſt probable, that on trial this water will be found to be a chalybeate, which contains either a true or a calcareous Glauber ſalt.

ASTRACHAN.

ST. PETERS.

In the twelfth volume of the *Commentarii de rebus in medicina & philoſophia naturali geſtis*, part ii. § 4. page 218, we have an account of a book publiſhed at St. Peterſburg, in the German language, called *Horæ ſubſecivæ chymiæ*, by Monſ. *Jo. George Model*, in which we are told, that in the kingdom of Aſtrachan there are warm baths, called Thermæ Sti. Petri, vel Bragunenſes, the waters of which are impregnated with a vitriolic acid and an ochre, a neutral ſalt analogous to Glauber ſalt, and an argillaceous or cretaceous earth; and near to theſe baths is a cold water of the ſame nature as the hot.

WALLACHIA.

BATHS OF HERCULES.

The baths, formerly called *Thermæ Herculanæ in Dacia*, are ſituated not far from the Danube, near the river Tſerna or Zerni, in that part of Wallachia called Temeſwar, between Meadia and Orſova.

Thoſe baths had been long in ruins, and forgot till Count *Hamilton* was appointed governor of the province of Temeſwar, who ordered a number of workmen to dig into the ruins, in ſearch of them and of other Roman antiquities; and they were ſo lucky as not only to diſcover theſe warm waters, but likewiſe a number of Roman inſcriptions, by which it appears, that theſe baths had been erected about the year of Chriſt 140 or 152, and that they had been then in great repute.

By Count *Hamilton*'s directions the baths were rebuilt and repaired, and an account of them and of their waters publiſhed at Vienna, in the year 1737, by Mr. *Paſchal Caryophilus* [x], who tells us, that the analyſis of the waters was made by Dr. *Joachimus Crammer*.

Theſe waters, he ſays, have a ſtrong ſulphureous ſmell, are very warm, and, like other acidulæ, have a little of an aſtringent taſte, and depoſite to the bottom of their baſons and channels a quantity of a brown or yellowiſh ochre, which when calcined is found to contain a number of particles which are attracted by the loadſtone; they are extremely limpid, and tranſparent, as they riſe up into their baſons, and they ſuffer no change by the mixture, either of acid or of alcaline liquors; and, when weighed in a hydroſtatical balance, they were found to be lighter than rain water, from which, he ſays, one might conjecture that they contain no mineral matter; but Dr. *Crammer* obtained by a chymical analyſis, not only common ſalt and nitre, but likewiſe an aſtringent earth, a ſulphureous liquor, and a ſmelling bitumen, in which was invelopped a fixt alcaline ſalt.

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[x] See two diſſertations, *De Thermis Herculanis nuper in Dacia detectis, Paſchalis Caryophyli*, publiſhed at Vienna, in 1737, and afterwards republiſhed at Utrecht, 1743.

The *ſea ſalt* manifeſted itſelf by the cubic figure of its chryſtals, and the nitre by its aſſuming the form of oblong pellucid bodies, which were a little pointed, and were neither acid nor alcaline, and had a bitter cool taſte, and diſſolved in a ſmall quantity of water; they were not inflammable nor decrepited on the fire, but melted very eaſily, and remained fluid, without ſuffering any change; from this deſcription it ſhould ſeem, that this laſt ſalt which he calls nitre, was not ſo, but was a true Glauber ſalt.

The account of the analyſis is greatly too ſuperficial, and it is to be wiſhed that we had one more exact and particular.

CHAP. IV.

OF HOT CHALYBEATE WATERS, WHICH HAVE A STRONG SULPHUREOUS SMELL.

ALTHOUGH a great number of hot chalybeate waters are ſaid by authors to have a ſulphureous ſmell, yet few ſuch have hitherto been carefully examined; and I have not met with but three accurate accounts of waters of this kind, the one of which (the water of the *Capucins at Vichy*) we already mentioned under another head, the other two we ſhall now conſider, which are

GERMAN.	*ITALIAN.*
HIRSCHBERG.	PORRETTA.

The

GERMAN.

HIRSCHBERG.

The warm baths are ſituated at a place called from thence *Warm-brunn*, about three Engliſh miles from the town of Hirſchberg, in Sileſia.

Dr. *C. Mich. Adolphus* [y] gives the following account of them: there are two ſprings of hot water here, at a little diſtance from one another, each of which ſupply a bath, which is covered with a building, and the waters ſpring up from the bottom of the baths.

One of the baths belongs to an abbacy, the other to the family of *Schafgotſchin*.

The bottom of the bath, belonging to the abbacy, is commonly covered with gravel and mud, mixed with a ſulphureous or bitumenous matter, and ochre.

The bottom of the other bath is covered with a fat, argillaceous, greeniſh mud, intermixed with ſand.

When the two principal baths are full, the water runs off by pipes into a large bath, which is appropriated for the uſe of the poor, and from thence conveyed into a horſe bath.

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[y] See his account of them in his *Tractatus de Fontibus quibuſdam ſoteriis*, publiſhed at Leipſick and Breſlaw, 1733.

In entering the houſes, where the baths are, one meets with a ſtrong, lixivial, ſulphureous ſmell and ſmoak, eſpecially in the bath-room belonging to the family of *Schafgotſchin*.

The water in both baths is limpid, clear, pellucid, and tending to a whitiſh, blueiſh colour; but the *Schafgotſchin* bath is in common the moſt turbid and whitiſh, with numerous air bubbles ariſing to its ſurface.

The heat of both is temperate, and pleaſant, and both raiſe the thermometer to the ſame degree.

On the ſurface, there is a thin, fattiſh, earthy pellicle; though he ſays, that ſometimes the pellicle is a pure bitumen, eſpecially in the bath belonging to the abbacy; and there is obſerved, floating in the water, a number of particles like flocculi of feathers, or duſt of aſhes; and it is remarked, that when this matter is in large quantity, that the water is more nauſeous, and apt to give a pain in the ſtomach when drank; and he ſays, that in the year 1731, from April to October, there was ſuch a quantity of a bitumen in the Schafgotſchin fountain, that the waters were not fit for internal uſe[z].

A viſcid mucus adheres to the ſtones of the baths; and ſometimes a matter, reſembling true flowers of ſulphur, is found ſticking to the beams of wood put round the ſides of the baths.

A thin, viſcous, black, blueiſh, clay matter adheres to the ſtones over which the water runs; and ſmall pipes, about the length of the finger or hand, like thoſe of coral, are found adhering to the ſides of the conduits or channels in which this water runs; theſe, he thinks, a reformed by this viſcid matter, mixed with ochreous and gypſeous earth, adhering to fibres of wood, which ſeparate from the ſides of the pipes through which the water runs, and afterwards hardening into this ſort of ſtony matter.

When the water is taken up immediately from the fountain in a glaſs, a great number of air bubbles are obſerved to ariſe from the bottom to the ſurface, and to adhere to the ſides of the glaſs like pearls.

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[z] Vide tract. ante citat. p. 67.

A pound and five grains of water, taken up from either fountain, decreaſe eight grains in quantity by cooling; and by the hydroſtatical balance, theſe waters when warm, are lighter than common water, but heavier when cold.

They feel ſalt, viſcid, and ſlippery to the touch; they have a ſulphureous, lixivial ſmell, which is ſtrongeſt before wind, and in rainy weather, and is moſt fragrant when the baths are emptied, and the water ariſes immediately freſh from the ſpring; their taſte is at firſt lixivial, ſweetiſh, and ſubaſtringent, but ſoon becomes ſomewhat acrid, lixivious, and partly bitteriſh and nauſeous, but is more agreeable the hotter the water is.

If they be kept for ſome days in any veſſel, ſome thick variegated matter ſubſides.

If taken freſh out of the fountain, galls or oak bark ſtrike a purpliſh colour; but after they are cold, theſe aſtringents only make them turbid.

When freſh, they immediately tinge ſilver of a dark colour, and they heighten the colour of gold.

In diſtilling them, what comes over differs in nothing from common diſtilled water, nor is any ſulphureous ſmell to be perceived, or any other marks of ſulphur, unleſs it be that it blackens an alembic hung at the mouth of the retort.

In diſtilling a large quantity of theſe waters, nothing remarkable is obſerved, till the liquor is reduced to a few pounds, then it becomes more and more of a reddiſh colour, eſpecially the water of the Schafgotſchin fountain; and if the retort, in which the water is diſtilled, has a wide bottom and a ſmall neck, then one finds a ſal volatile, in form of ſmall chryſtals, adhering to it; and on the ſurface of the water, one perceives a ſaline, lixivial cruſt, or pellicle, which taſtes like ſalt of tartar, but is more nauſeous; and if an acid liquor be dropt into the water, at this time, it depoſites a thick reddiſh ſediment, and the liquor above becomes more pellucid.

If part of this concentrated water be kept in a cool place for ſome days, ſometimes a number of chryſtals about the ſize of a barley-corn, ſome larger, ſome ſmaller, are found either at the bottom, or ſuſpended in the liquor, but it never depoſites any other ſediment, though kept long, nor does this water putrefy ſoon.

When the diſtillation of the water is continued till all the water is evaporated, there remains at the bottom of the retort an earthy ſaline ſediment, of a white, reddiſh colour, with an unequal ſurface, like as if there had been a number of air bubbles broke; this ſediment has a lixivious, ſubſtringent, nauſeous taſte, and a lixivious, heavy, and ſometimes ſulphureous ſmell.

Twenty pounds of the Schafgotſchin water yielded a drachm of ſediment, of which a ſcruple is a pure natron, or alkaline ſalt, and two ſcruples are earth.

The ſame quantity of the water, belonging to the abbacy, yields a drachm and a half of ſediment, of which half a drachm is an alkaline ſalt, and a drachm earth.

The earth of theſe waters, when well waſhed, and deprived of its ſalt, is of a whitiſh clay or aſh colour, and ſometimes fattiſh, and ſometimes intermixed with a number of ſmall filaments twiſted together, and the loadſtone applied to ſixty-ſeven grains of the earth of the Schafgotſchin fountain attracted three or four grains of a martial earth out of it.

If ſome of the ſediment of theſe waters be thrown on the red-hot coals, part of it is inflamable; and if it be mixed with ſalt of tartar, a hepar ſulphuris may be obtained from it.

The paper, in which the ſediment is kept, becomes oily, and when handled, greaſes the fingers.

In evaporating the water, in which the ſediment has been waſhed, to obtain the ſalt, generally the laſt portion of it is bitter.

Dr. *Adolphus*, in ſumming up the contents of theſe waters, ſays, that they contain a volatile ſulphureous and mineral ſpirit and a volatile acid, and that by evaporation, one obtains a ſediment compoſed of a native alcaline ſalt, an ochre or iron, a bitumenous or ſulphureous matter, and an earth, and he alledges, that the earth is mixed with ſome particles of alum, but brings no certain proof of this.

The volatile alcaline ſalt, which he mentions to be found ſometimes in the neck of the retort in which the water is diſtilled, is probably produced by the heat uniting more intimately the oily matter with part of the fixed alkali, and ſubliming it in form of a volatile ſalt, in the time the proceſs is carrying on; for he has mentioned no proofs to ſhew that it originally exiſted in the waters, though he has alledged that it does.

Though they contain ſuch a ſmall portion of ſolid matter, yet, he ſays, they are purgative, and promote perſpiration and urine.

One common effect of theſe, with many other waters, is to throw out on the ſkin on firſt uſing (eſpecially of thoſe who go into the bath) a number of little red or purple ſpots, which continue but for a week; though ſometimes for two, three, or more, and then vaniſh or diſappear.

Theſe waters are recommended in variety of caſes, in the rheumatiſm, gout, palſy, ſcrophula, and in many other diſorders; and the bathing in, and the drinking of them, have been particularly recommended, in cutaneous diſeaſes, and for the cure of old ulcers and ſores; and they have been praiſed for the ſervice they have done in cholicky pains, ſpaſms, cramps, and other complaints of this kind.

ITALIAN WATERS.

PORRETTA,

Situated on the river RENO, at the bottom of the Appenine mountains, about thirty-two miles ſouth-weſt of BOLOGNA.

The baths of Porretta have long been in repute for the cure of diſeaſes.

F. Leandro Alberti [a], and many other authors alledge, that they were firſt taken notice of in the year 1375, by a lean, diſeaſed bullock, which was feeding in the neighbourhood, drinking of theſe waters, and thereby recovering its health and ſtrength; but it appears from authentic records, kept in the archives of Bologna [b], that theſe baths were known and uſed in the year 1205.

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[a] See his *Deſcrittione di tutta Italia*, fol. 330, &c. publiſhed at Venice, 1596.

[b] See a treatiſe *Delle Terme Porrettane, chap.* vi. *page* 252, publiſhed at Rome, 1768.

F.

F. Leandro Alberti ſays they are very hot, and come out of a ſulphureous ſtone; and that flames are frequently ſeen coming out of the crevices of the rock in their neighbourhood; that the waters have a ſalt taſte, and are much uſed for the cure of diſeaſes.

And *Baccius* recommends them in foulneſs of the ſtomach and bowels, in caſes of worms, in obſtructions of the liver, in the anaſarca, and in various other diſorders.

In the year 1768, there was a very particular account publiſhed of theſe baths [c] by an anonymous author, in which many particulars are mentioned, which have not been obſerved in the analyſis of other waters.

The town of Porretta lies thirty-two miles ſouth of Bologna, on the banks of the river Reno, at the bottom of the Appenine mountains; and juſt above it, is a hill, called *Monte di ſaſſò cardo*, where there was formerly a volcano.

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[c] This treatiſe is publiſhed in 4to. at Rome, 1768, and intitled, *Delle Terme Porrettane.*

At the bottom of this mount, on the left ſide of a brook, is a fountain, called *Porretta nuova*, or *del leone*.

A few ſteps below this are the antient baths, which were long buried and loſt, but were lately diſcovered and fitted up for uſe, and are ſupplied by three ſprings, called, *Tre fonti delle donzelle.*

A little weſt of this is a bath called *Del bue*, which is ſupplied with ſprings, which riſe up in its own bottom.

On the other ſide of the brook, at the bottom of the hill called *Monte della croce*, are four other baths; two of which, the *Bagno reale* and the *Bagno di marte*, formerly called *Bagno ſcuro*, are filled by particular ſprings, which riſe through chinks in the floors of the baths; the other two, are ſupplied with water conveyed by pipes from the three fountains, Delle donzelle.

About the third of a mile above Porretta, by the ſide of the river Reno, is a fountain, called *Puzzola.*

And a little above this, is another, called *Fontana della Porretta vecchia.*

SECT. I.

Of the waters of old Porretta, (*Poretta vecchia*); 2. Of the Ant, (*Della puzzola*); 3. And of the young Ladies, (*Delle donzelle*).

The difference of ſeaſons, and of wet and dry weather, has no effect on theſe waters; they remain always the ſame as to quantity and quality.

They have a ſtrong ſulphureous ſmell, and are extremely limpid at their ſprings; but loſe a little of this extreme tranſparency when they cool, and their fine volatile parts have evaporated.

They feel ſoft to the touch, and keep for years in well corked bottles, without depoſiting any ſediment, or corrupting, or ſuffering any other change than their loſing their fine volatile principles.

They diſcharge a great quantity of air bubbles, immediately as they riſe up into their baſons and baths; they condenſe a ſmall matter on cooling, as one may obſerve by filling long narrow-necked flaſks with them at their ſprings, and they increaſe ſomewhat in their ſpecific gravity.

The water of the *Porretta vecchia* is the lighteſt of all; and that of the *Donzelle* becomes the heavieſt by keeping.

Their heat raiſes the quickſilver in *Fahrenheit*'s thermometer, as follows,

Of the *Porretta vecchia*	to	92.
Of the *Donzelle*	—	86.
Of the *Puzzola*	—	81.

They are highly impregnated with volatile principles, which from the following obſervations and experiments appear to be, firſt, *a mineral ſpirit*; ſecondly, *a volatile vitriol*; and thirdly, *a volatile ſulphur.*

I. That they contain a mineral ſpirit, is demonſtrated by their diſcharging ſuch a number of air bubbles, when they riſe up into their baſons; and by their diſcharging a vapour and froth with ſome of the water to ſome diſtance on the removal of a finger, which has been held on the mouth of a flaſk which has been two-thirds filled with the waters taken up from their fountains, and after wards been well ſhaked. The water of the *Porretta vecchia* ſhould ſeem to be the moſt ſpirity, for it flies to the greateſt diſtance.

They loſe intirely this ſpirit, by being expoſed to the air in open veſſels; but retain a little of it for ſome time, if they be taken up from their wells in bottles, which are immediately well corked and ſealed; however, if they be kept long, they do not ſparkle when poured into a glaſs.

As they loſe their mineral ſpirit ſoon, and keep long ſweet, we cannot attribute their preſervation from corruption to this ſpirit, but to more fixed principles.

What is this mineral ſpirit? is it only a highly attenuated air, prepared and rendered of the utmoſt ſubtility in the bowels of the earth? or is it that primogenial very volatile mineral acid, which is only to be known by its effects? and is called the ſpiritus rector of all mineral waters.

It is very difficult to determine this queſtion; for the experiments which were tried to aſcertain it, ſtill left it doubtful.

1ſt. Neither blue paper expoſed to the vapour of theſe waters, nor tincture of heliotropium, nor ſyrup of violets, mixed with the waters as taken up immediately from their fountains, acquired the leaſt red colour.

2d. Oleum tartari per deliquium dropt into a cup-full of theſe waters, occaſioned no more inteſtine motion, than is common on the mixture of any two liquors of different ſpecific gravities; nor did the mixture of crabs eyes give any marks of an acid.

3d. The recent waters had not the leaſt ſmell of an acid; nor did they acquire any by being ſhaked in a flaſk two-thirds full.

4th. Some drops of oil of tartar put into a flaſk, which was afterwards filled with water from the ſprings, ſeemed to deſtroy the *mineral ſpirit*; for it prevented the water from frothing, and emitting a vapour when the water was ſhaked, and the finger immediately removed from the mouth of the flaſk.

5th. Some drops of oil of vitriol mixed with water, which had ſtood in an open flaſk till it had become effete, and ſeemed to have entirely loſt its ſpirit, reſtored the loſt mineral ſpirit; for on ſhaking the flaſk, a vapour aroſe, which preſſed againſt the end of the finger, and on removing the finger, it frothed and ruſhed out with a noiſe, as if the water had been taken up freſh from the fountain.

6th. On examining the leaden and braſs pipes through which the waters of the *Porretta vecchia* and of the *Donzelle* run, there was found on the upper part of the inſide, where the waters never touched, but which is expoſed to their vapour, a *white ceruſe* on the leaden pipe, and a *green verdigriſe* on the braſs.

7th. A piece of red ſilk put over the mouth of a retort, where the freſh waters were diſtilling, became of a darker and purpliſh colour, which is reckoned a ſure mark of a fine acid.

Hence we ſee, that though the three firſt ſet of experiments gave no marks of the mineral ſpirit containing a fine acid, yet that the four laſt did.

II. The ſecond volatile principle, which theſe waters were ſaid to contain, was a volatile martial vitriol.

This is not to be obtained by any artificial evaporation, or diſtillation of any quantity of the waters in veſſels, but was demonſtrated by confining the vapour of of the waters of the *Poretta vecchia.*

Theſe waters diſcharge themſelves, by two pipes, into a ſtone baſon; which again diſcharges itſelf into a ſubterraneous aqueduct, that carries the waters to the river Reno. In the floor above the aqueduct, at a ſmall diſtance from the ſtone baſon, is a hole about the width of two fingers, which goes down into the aqueduct below, through which the vapour of the water riſes conſtantly. To this hole the author, in the ſpring time, adapted a glaſs receiver, and luted it ſo that none of the vapour could eſcape: it was immediately filled with the vapour, and he let it remain in the ſame poſition for a month; at the end of which time he removed it, and found in the receiver, and in the mouth of the hole, a concrete and incruſtated ſubſtance like ſtalactite, which was friable, of a yellow colour, free of all ſmell, readily ſoluble on the tongue, and of acid ſtyptic taſte; it turned blue paper of a beautiful purple colour in a few minutes, as it did the ſyrup of violets, and tincture of tournſol; and it made ſome efferveſcence with oleum tartari per deliquium.

On being calcined it became a true colcothar, which, after being waſhed to carry off its acid, and recalcined with an oily matter, afforded a number of particles of iron which were attracted by the loadſtone. Hence this concrete ſubſtance ſhould ſeem to be a true vitriolum martis, in which the vitriolic acid is prevalent; and hence it ſeems evident that this water, as it riſes from its ſprings, is impregnated with a fine volatile martial vitriol, which is in ſuch ſmall quantity as not to be diſcovered in any quantity of water that can be contained in common retorts or ſtills; but is demonſtrated by confining, for a long time, the vapour which is naturally and conſtantly ſublimed from the whole body of water, that is diſcharged from its ſprings, as it paſſes through its aqueducts.

This experiment was only tried with the vapour of the water of the fountain of Porretta vecchia, where the particular ſituation gave an opportunity of performing it with eaſe; though the author makes no doubt but that the waters of the *Puzzola* and *Delle Donzelle* are impregnated with the ſame principles.

The

III. The laſt volatile principle, which theſe waters were ſaid to contain, was ſulphur; this manifeſts itſelf immediately by the ſmell, which is ſtronger in the waters of the fountains of *Poretta vecchia* and *Puzzola* than of the *Donzelle*; though all the three waters, and their vapours diſcolour ſilver, and brighten the colour of gold.

No fixed concrete ſulphur, or flowers of ſulphur, are to be ſeparated from theſe waters by any chymical operations hitherto known; though it will be made appear preſently, that they contain a volatile ſulphur, which ſoon diſſipates itſelf through the circumambient atmoſphere, after the waters are diſcharged from their ſprings, and come in contact with the external air; and that a real fixed ſulphur makes part of that white mucilaginous matter, or ſludge, which is found in the baſons and channels of all theſe waters, though more in thoſe of the *Porretta vecchia* and *Puzzola* than of the *Donzelle*.

In order to catch, if poſſible, ſome of the volatile ſulphur, and to procure ſome of the white ſlimy matter or ſludge which adheres to the ſides and bottom of the baſons,

ſons, or to branches or leaves of trees, or other ſolid bodies left in them, the author placed a large ſtrong plant of the glove thiſtle (*echinopus vulgaris*) perpendicular in the baſon of the *Porretta vecchia*, into which the pipes diſcharge the water from the ſprings, with part of the leaves of the plant above, and part below the ſurface of the water; judging that the leaves, which are rough, and downy on their lower ſide, would attract and catch hold of the fine ſulphureous particles, if they were not too volatile; and if collected in quantity would become viſible, and proper for making experiments with, to aſcertain their nature.

After four days, the plant appeared to be ſtill ſtrong and vigorous; and there was a quantity of the white ſlimy matter, or ſludge, adhering to the leaves of the plant below the ſurface of the water; and a vaſt number of very ſmall yellow globular bodies adhering to the lower ſides of the leaves, which were above it.

The experiment was repeated with another plant with the like ſucceſs, and a ſufficient quantity of both the yellow globular bodies, and of the white ſludge, were collected for trying experiments with.

The yellow globular bodies neither fermented with oil of tartar, nor gave any black colour with galls, nor were ſoluble in water; they were inſipid to the taſte, but gave a ſmell of hepar ſulphuris, and turned ſilver immediately of a yellow colour; and after they were dried, and had loſt their ſmell, they had ſtill the ſame effect upon ſilver when rubbed upon it; and when put on a red-hot iron they immediately emitted a ſtrong ſmell of burning ſulphur, and evaporated entirely in form of a fetid ſmoke.

The ſame experiments were repeated with the white ſlimy matter or ſludge, and with the ſame event; only that, when thrown on the red-hot iron, it did not evaporate entirely into ſmoke, but left behind a ſmall quantity of an inſipid, aſh-coloured, calcareous earth.

To aſcertain more exactly the nature of this ſulphur, half a ſcruple of the yellow globular bodies were put, with a ſufficient quantity of oleum tartari per deliquium, into a glaſs matraſs; and the ſame quantity of the white ſludge, with a like quantity of oleum tartari into another matraſs, and both were ſet upon a ſand heat; they both diſſolved like common ſulphur, and emitted a ſtrong ſulphureous ſmell.

Silver dipt into theſe ſolutions became immediately yellow, and then black.

Some drops of vinegar mixed with them fermented a little, and occaſioned a ſtrong ſmell of hepar ſulphuris, but did not make them in the leaſt white as might have been expected.

Some more drops of vinegar were added to both, and they occaſioned a little whiteneſs in the matraſs with the ſludge, but none in the one with the globular yellow bodies.

But upon adding an equal quantity of vinegar to the liquors which were in the matraſſes, the ſulphureous ſmell increaſed, and both became white, and, after ſtanding ſome hours, dropt a very little of a yellow ſubſtance, which proved to be a butter of ſulphur; but the liquors both remained milky for ſome days, with part of the ſulphureous ſubſtance ſtill ſuſpended.

Hence it is evident, that theſe waters contain ſulphur, and juſtly deſerve the name of ſulphureous, though they did not become in the leaſt white, when vinegar was dropt into a glaſs-full of them, juſt after being taken up from their fountains. And it appeared from repeated experiments that the water of the *Porretta vecchia* was the ſtrongeſt; of the *Puzzola* next; and that of the *Donzelle* the weakeſt of the three.

The author ſays, as theſe waters have been proved to contain a volatile martial vitriol, it may be aſked, why ſome of it was not found on the lower part of the leaves of the echinopus, mixed with the condenſed volatile ſulphur? He ſeems to think that this muſt have been owing to the vitriol being more volatile, or to its being neceſſary to confine the vapour in cloſe veſſels for a long time, in order to concentrate and condenſe it. If this is the caſe, I think another queſtion might be aſked, which the author has omitted; and that is, Why was not ſome condenſed volatile ſulphur found in the glaſs receiver in which the condenſed volatile martial vitriol was collected? Theſe are difficulties which the curious, who have opportunities of examining the waters of their fountains, only can reſolve.

The fixed principles with which theſe waters are impregnated are, 1. Sea ſalt; 2. A foſſil alkali; 3. Iron; 4. And a calcareous earth; to which may be added an oily matter.

The ſolutions of ſilver, and of quickſilver, dropt into a glaſs-full of the waters, when freſh, immediately turned them milky, and a precipitate dropt to the bottom. The precipitate of the ſilver became duſkiſh, and that of the quickſilver a little yellow; the one ſhewed a ſulphureous principle, the other a vitriolic acid; but if the ſolutions were not dropt into the water till they had ſtood ſome time, and their volatile parts had evaporated, the precipitates remained always white.

By putting a quantity of theſe waters into an open veſſel, and allowing them to evaporate of themſelves without the aſſiſtance of artificial heat, or even expoſing them to the ſun[d], he obtained a reſiduum which yielded two ſorts of ſalt, *ſea ſalt* and a *foſſil alcali.*

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[d] The author ſays, that he always uſed this method, both in evaporating the waters themſelves, and the water with which their ſolid contents were lixiviated or waſhed.

Theſe waters gave no marks of iron by the taſte, nor by depoſiting an ochre in their baſons or channels, nor by any appearance obſerved on the ſurface of eggs, which had lain in their baſons for ſeveral days.

And the firſt hint that the author had of their being chalybeates, was from obſerving a fine variegated cuticle come on the ſurface of the waters, on dropping oleum tartari per deliquium into them; which, on examining, appeared to be compoſed of very fine particles of ochre, united to an oily matter.

This oily matter ſhews itſelf in the ſtone baſons, which receive the waters; and once there was found in the ſpring of *Porretta vecchia*, a ſubſtance like liquid pitch, which greaſed the paper in which it was kept, and ſhewed that it contained ſome particles of iron on the application of the loadſtone: and a fine oily or bitumenous ſcum is ſometimes obſerved on the ſurface of the water in the baſon of the *Puzzola*.

A decoction of galls, or of other aſtringent plants, dropt into theſe waters, ſhews them to be chalybeates: if dropt into the recent waters, it after ſome time, ſtrikes by degrees a purple colour; but effectuates this change of colour much ſooner, if the waters have ſtood a little, till ſome of their fine volatile principles are gone; and ſtill ſooner, if part of the waters have been previouſly evaporated.

The earthy, or inſoluble part of the ſediment, being put on a piece of ſilver after it was made red-hot, acquired ſomewhat of a reddiſh colour, but no flame or ſmoke was to be obſerved, and the loadſtone then attracted no particles from it; but after this ſame ſediment, was recalcined with an oily matter to reſtore the phlogiſton to the chalybeate particles, it was reduced to a black powder; and the loadſtone on being then held near, attracted a number of particles which were iron, but which had been mixed with and hid in the earthy part of the ſediment. The author reckoned, that each medical pound [e] of the water contains about one grain of iron, which, he thinks, makes no part of the volatile martial vitriol before-mentioned.

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[e] He ſays, that the Italian medical pound contains twelve ounces; that each ounce contains eight drachms; each drachm three ſcruples; each ſcruple ſix carats; and each carat four grains.

They contain likewiſe a ſmall quantity of a fine calcareous earth, which does not manifeſt itſelf in the water by the mixture of acids; nor by any viſible cloud or precipitate on the addition of alkalies; nor by any ſediment dropt when they are kept, except that ſometimes a very thin doubtful pellicle is to be obſerved at the bottom of the veſſels in which they have ſtood long. From this account of theſe waters, it is evident, that they are all impregnated with nearly the ſame principles, both volatile and fixed, though in different quantities; the exact proportions of the volatile cannot be aſcertained, but in general, the more they contain of the volatile, the leſs is the quantity of the fixed.

They are all impregnated with a volatile elaſtic æthereal mineral ſpirit, and a volatile ſulphur; and the waters of the *Porretta vecchia* and *Puzzola* with a volatile martial vitriol likewiſe, as is probably the waters of the *Donzelle*.

And they contain the following quantities of ſolid contents, which were obtained by evaporation from a medical pound of each:

	Muriat. ſalt.	Foſſil Alkali.	Iron.	Calcareous earth.
Porretta vecchia	15 gr.	5 gr.	1 gr.	1 gr.
Puzzola	25 gr.	8 gr.	1 gr.	1 gr.
Donzelle	33 gr.	11 gr.	1 gr.	2 gr.

And the heat of the *Porretta vecchia* raiſed *Fahrenheit*'s thermometer to ninety-two; of the *Puzzola* to eighty-two; and of the *Donzelle* to eighty-ſix.

SECT. II.

1. Of the waters of the fountain of the lion (*Del leone*). 2. Of the bath of the oxen (*Del bue*). 3. Of the royal bath (*Bagno reale*). 4. Of the bath of Mars (*Bagno di Marte*).

The waters of the fountain of the lion are conveyed into a ſtone baſon, by means of a braſs pipe; but the waters of the baths ſpring up through crevices in the ſtones, or rocks in the bottom of the baths.

All theſe waters are extremely limpid as they riſe from their ſprings; but loſe a little of their fine chryſtalline tranſparency as their volatile parts evaporate, and they become effete.

They have no heavy or ſulphureous ſmell, and they are ſo ſoft to the touch that they feel unctuous, or like a very thin fine broth, particularly the water of the fountain of the lion.

They do not eaſily freeze, even after they have ſtood till they are cold, and their volatile parts have evaporated; for put into open deep veſſels in time of a hard froſt, no appearance of freezing was obſerved, till the quickſilver, in *Fahrenheit*'s thermometer, had fallen to twenty-ſeven.

They keep long without corrupting, and if kept, even in large quantity, they depoſite no ſediment; though ſometimes a very fine thin pellicle is obſerved at the bottom of the veſſels.

They become ſpecifically heavier, by loſing their volatile principles.

They are good for boiling greens, and bleaching linen.

Their heat is at all times the ſame; the water *Del leone* raiſes the quickſilver in *Fahrenheit*'s thermometer to eighty-eight; *Del bue* to ninety-eight; *Di bagno reale* to ninety-four; and *Di Marte* to ninety-ſix.

By a repetition of the ſame ſort of experiments made with the other waters, the author found that they contained volatile and fixed principles, though ſomewhat different from the former.

The volatile principles are, 1. A *mineral* ſpirit; 2. *An inflammable vapour* and *mineral bitumen*; but no volatile ſulphur, or volatile martial vitriol.

The *mineral ſpirit*, or *fine elaſtic mineral air* manifeſts itſelf, in the ſame manner, as in the other waters already treated of; and it evidently ſhews, that it contains a portion of a fine *volatile acid*, by the vapours of the waters corroding all the metals in their baths, particularly iron; and that in a very ſhort time.

The *inflammable vapour* is extremely volatile, and catches fire as ſoon as a lighted torch is brought near the ſurface of the waters; and neither the difference of ſeaſons, nor of weather, makes any increaſe or diminution of the quantity of this vapour, though its appearance and quantity is not the ſame in all the ſprings. When the royal bath and the bath of Mars are full, it riſes by intervals from the bottom with a gurgling noiſe, in form of air bubbles; but when they are empty, it paſſes inſenſibly through the chinks and crevices. In the fountain of the *lion* it is conſtantly diſcharged with the water without any noiſe; and when the bath of the oxen (*del bue*) is empty, it comes up through the crevices in the bottom with a murmuring, and blebbing like a thick liquor when it boils; and when the bath is full, it riſes conſtantly through the water, in form of air bubbles.

As ſoon as theſe bubbles come to the ſurface of the baths, they break and diſcharge the vapour, which is ſo extremely fine that it cannot be obſerved, though one looks at the bubbles when they break, with the greateſt attention.

This vapour has no ſenſible ſmell in any of the baths, or fountains now treated of; but manifeſts itſelf by the following effects: it inſtantly almoſt tarniſhes the ſhining brightneſs of ſilver, hung at a very ſmall diſtance from the ſurface of the water, immediately above where the vapour bubbles riſe, and ſoon turns it of a dark colour; but if the ſilver is above the ſurface of the water, at a place where no bubbles are to be obſerved, it ſuffers no change of colour.

And if a lighted torch or candle is held above the places where theſe bubbles break on the ſurface, the vapour immediately catches flame; but no ſuch thing happens, when held above any other part of the bath, where no bubbles ariſe from the bottom.

As the vapour bubbles riſe at interrupted intervals, and not conſtantly, in the *royal bath* and in the *bath of Mars*, the flame is repeatedly lighted and extinguiſhed, while a torch or candle is held above their ſurface; and if only once lighted is ſoon extinguiſhed: but as it is conſtantly diſcharged from the bath of the *oxen*, and along with the water of the fountain of the *lion*, if once the vapour of theſe waters is lighted it continues burning, ſo as to give an opportunity of making obſervations, and trying experiments with it.

The flame, of the vapour of the fountain of the *lion*, riſes two or three inches, burns till it is extinguiſhed, and emits no ſmoak, or any vapour which occaſions ſneezing or coughing when drawn up into the lungs; the lower half of the flame appears of a clear blueiſh colour, the upper of a reddiſh; and in the blue part one obſerves at times ſome ſparks of bright flame, like burnt coal.

In the bath of the oxen (del bue) when the vapour was lighted, the flame roſe about two feet, or more, with a murmuring noiſe, and had the ſame appearance as the flame of the *lion.*

A receiver was put above the flame of the fountain of the lion, in order to catch and condenſe any vapour which it emitted, but nothing was collected but an inſipid watery phlegm, which had ſomewhat of an empyreumatic ſmell.

Some people, he ſays, have imagined that the inflammable vapour did not riſe in the bubbles from the bottom of the baths; but that it was diſperſed every where through the water; however, what has been already ſaid of ſilver being tarniſhed, and of a torch lighting a flame on the ſurface of the water, at thoſe places only where the bubbles riſe, ſhews that they are miſtaken: and he tells, that he was twice fortunate enough when he was making his experiments, to obſerve large bubbles which ſwam for ſome time on the ſurface of the water, which very rarely happens; and that he followed them, broke them with a lighted torch, and that ſo ſoon as they burſt their vapours catched flame, and went off in a flaſh.

It may be aſked, why none of theſe vapour bubbles, which ariſe in ſuch quantity in the baths, are obſerved in the water of the fountain of the lion; this he ſays, is owing to the water of this fountain being firſt diſcharged, from its ſprings into a baſon, where theſe bubbles break, and the vapour having no other way to diſcharge itſelf, is conveyed with the water through the pipe, and mixes itſelf with it in its paſſage.

The *oily, or bitumenous matter* [f], is not, to be obſerved on the ſurface of the waters, in the bathing ſeaſon, when the baths are ſo often emptied and filled; but it is demonſtrated, by the following facts and experiments.

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[f] The author ſeems to think that the water derives its unctuous properties from the inflammable vapour.

The inſide of the ſtone baſon of the fountain of the lion, where the water ſtrikes, and no where elſe, becomes blackiſh and ſmooth; and there adheres to it filaments of a white, ſmooth, ſlimy ſludge which diſcolour ſilver, and are ſimilar to thoſe found in the baths of the *Porretta vecchia*, and *Puzzola*, which were demonſtrated to contain ſulphur.

A man went into the bath of the oxen, (del bue) which abounds moſt with this vapour; and on coming out of the bath, the water ſtood in large drops on the ſurface of his ſkin, and the places between ſeemed dry; juſt as would have happened to a man whoſe body had been anointed, before going into the bath.

When the bathing ſeaſon was over, the baths were allowed to fill, and from time to time, as much water let out by means of a cock placed near to their bottoms, as the ſprings threw into the bath; and by theſe means, the baths were kept conſtantly full, and were prevented from running over, and their upper ſurface remained always quiet and undiſturbed.

1ſt. The bath of *the oxen* (*del bue*) was left in this ſituation.

2d. A large linen bag filled with ſtraw, was ſo faſtened in the *royal bath*, as to ſwim a little above the ſprings, in the courſe of the vapour bubbles as they roſe from the bottom.

3d. And a blanket was ſpread over the ſurface of the *bath of Mars*, a little above the waters, ſo as to intercept, if poſſible, the inflammable vapour, after the bubbles had burſt, and it had eſcaped out of the water.

After ſome days, a fine brown, yellowiſh coloured pellicle was obſerved, on the ſurface of the waters of the baths *of the oxen*, and of *Mars*, at the places where the vapour bubbles riſe up.

The blanket, which was ſpread over the bath of Mars, was a little wetted, but no marks of any unctuous, or bitumenous matter could be obſerved on it.

And the lower ſide of the linen bag, filled with ſtraw, which ſwam in the *royal bath* above where the vapour bubbles riſe, was found at the end of three weeks, covered with a browniſh, yellow, thick, unctuous matter; but no bitumenous pellicle was to be ſeen on the ſurface of the bath, though the vapour bubbles, which had been obliged to turn round the ſack, before they reached the ſurface of the water, had preſerved their form, and their vapour had loſt none of its inflammable properties; by which it ſhould ſeem that the bubbles had only been deprived of their thick unctuous matter.

This unctuous matter, which adhered to the ſack, reſembled much the ſubſtances which are found in the crevices of mount Saſſo cardo, through which there iſſues an inflammable vapour, and thoſe got in the caverns where the waters of the fountain of the lion enter their aqueducts; and it did not affect the colour of a ſilver ſpoon, with which it was ſcraped off the bag.

When freſh it had no taſte, and only a very weak, and rather ungrateful ſmell, which had not in the leaſt affected the waters; but after keeping, it acquired a dark colour, and a naſty fetid ſmell.

When four ounces of this matter were diſtilled, there came over firſt an inſipid empyreumatic ſmelling vapour; then a fat dark coloured liquor with a bitumenous ſmell; and laſtly, there aroſe a ſaline ſubſtance, which attached itſelf to the curvature and neck of the retort; and there remained in the bottom of the veſſel a light ſpongy ſubſtance, by way of a caput mortuum, which, when taken out and powdered, was found to contain iron, for a loadſtone held near it attracted a number of particles.

From what has been ſaid, it ſhould ſeem that the bubbles contain two ſorts of matter; the one a fine volatile vapour which immediately eſcapes; and the other a more groſs unctuous matter, from which the fine vapour diſengages itſelf in the water, or at the inſtant it comes in contact with the external air, and evaporates; and it is this groſs matter which is found ſwimming on the ſurface of the water, and which attaches itſelf to the ſides of the baths and baſons in form of white unctuous ſludge, and which is to be obſerved ſwimming on the ſurface of the waters, when five or ſix pounds of them are kept in a large bottle with a narrow neck; and which falls to the bottom by ſhaking; and which is found in the ſediment left when a very large quantity of the water is evaporated.

And he thinks, that the ſparks and red flame, obſerved when the vapour of the fountain of the lion is lighted, ſhews a mixture of ſome groſs ſubſtance, which muſt be ſome of this unctuous matter.

The inflammable vapour ſhould ſeem rather to proceed from a fine naptha, or foſſil oil, than from ſulphur; for its flame neither emits a ſulphureous ſmell, nor does it excite ſneezing, or coughing, when drawn up into the lungs; though the effect of the vapour in tarniſhing ſilver, and the blue colour of part of its flame, ſeem to indicate the mixture of a fine volatile vitriolic acid; and it is probable, that ſome of this acid uniting with the groſſer bitumenous particles, is what forms the white groſs ſulphureous ſludge in the baths and baſons, after the waters have been diſcharged from their ſprings, and are expoſed to the air.

The white unctuous matter, or ſludge, which adhered to the linen bag hung in the royal bath, contained a ſmall portion of *ſal ammoniac*; for the white ſpungy ſaline matter which adhered to the neck of the retort, when ſome of this ſludge was diſtilled, was not ſtyptic, and did not decrepitate when put on a red-hot iron, but boiled up, ſwelled, and diſſipated itſelf into a ſmoke, which had an empyreumatic ſmell; and by mixing a few grains of this ſalt with a ſolution of corroſive ſublimate in water, which had become red and dropt a red precipitate on the addition of ſome drops of oleum tartari per deliquium, the liquor and precipitate became both of a very white colour; which ſhewed, that this ſpungy ſaline matter was a true ſal ammoniac, ſuch as is often found near to volcanoes; it ſeems to be in ſuch ſmall quantity in the waters, that it might almoſt have been omitted.

Theſe as well as the other waters of Porretta already treated of, are chalybeates; and on the addition of ſome drops of a decoction of galls ſtruck a deeper purple colour, though they ſhould ſeem to contain nearly the ſame quantity of iron; and by evaporation they were found to be impregnated with ſea ſalt, and a foſſil alkali, and a ſmall portion of a calcareous earth.

Hence we ſee, that theſe waters of the fountain of the lion, and of the three baths, of the oxen, of Mars, and the royal bath, contain a mineral ethereal ſpirit, a fine inflammable vapour, and a bitumenous matter, which ſeems to have a very ſmall pittance of a ſal ammoniac[y] mixed with it.

And the following quantities of ſalt, iron, and calcareous earth were obtained from them by evaporation:

	Mur. ſalt.	Foſ. Alk.	Iron.	Cal. Ear.
From the fountain of the Lion	49 ½ gr.	16 ½ gr.	1 gr.	1 gr.
From the bath of the Oxen	37 ½	12	1	1
From the royal bath and bath of Mars	36	12	1	1

And the heat of the bath of the lion, raiſed *Fahrenheit*'s thermometer to eighty-eight; of the bath of the oxen to ninety-eight; of the royal bath to ninety-four; and of the bath of Mars to ninety-ſix.

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[y] May it not be doubted, whether this ſalt originally exiſted in the water, or whether it was not generated by the force of fire?

SECT. III.

Of the medicinal properties and uſes of the waters of Porretta.

All the waters treated of in both ſections, but particularly the waters of *Porretta vecchia*, have been eſteemed extremely ſerviceable in graveliſh and calculous diſorders, both in preventing the generation of calculous matter, and in clearing it away after it is collected in the kidneys and bladder; and ſome people have even eſteemed it to be a powerful lithonthriptic, where large calculi were already formed; but this is ſaying too much for it.

They have been found extremely uſeful in the cholick, diarrhœa, dyſentery, and lientery, and are as efficacious in ſuch caſes as the waters of Tettucio, which have acquired ſo much reputation; for they equally cleanſe the firſt paſſages, correct acrimony, and heal little ulcers of the inteſtines: they are in ſo much repute, that the people in the neighbourhood, ſo ſoon as they are attacked with any of theſe diſorders, immediately reſort to Porretta, and drink the waters as an infallible remedy.

They have been eſteemed, particularly thoſe of *old Porretta*, for the cure of hyſteric, hypochondriac, and melancholic diſorders; and for removing ſterility in women, who have no natural defect in their organs.

They have been found to relieve pains of the ſtomach, and head, which proceed from the primæ viæ being foul and inert, particularly the waters of *old Porretta*, and of the *Donzelle*; and the drinking of theſe waters, joined to the uſe of the baths, douches, and vapour baths, have diſcuſſed ſwellings which had reſiſted the effects of other remedies; and thoſe of the baths of *the oxen*, of *Mars*, and of the *royal bath*, have been particularly ſerviceable in old rheumatic ſwellings.

They have been found to aſſiſt in removing ſwellings, and ſtiffneſs which remained after fractures and luxations; and in the cure of wounds and old ſores, particularly by pumping and waſhing the ſores with the water of the *Porretta vecchia* and of the *Donzelle*; joined to the bathing in the hotteſt of the baths.

And they have often cured very inveterate cutaneous diſorders, ſuch as the herpes, impetigo, ſcabies, &c.

And the water of the *Puzzola* has long been thought to be a uſeful remedy in the aſthma, and phthiſis of horſes.

As all the waters of Porretta are impregnated with a mineral ſpirit, and other volatile principles, they are moſt efficacious and in greateſt perfection at the fountain.

The beſt ſeaſon for uſing them is from June to September.

Bleeding and gentle purging are good preparatives to a courſe of theſe waters.

The waters of the lion, drank to about four pounds, operate mildly by ſtool; and may be uſed as a purge for cleanſing the bowels; or two or three drachms of the ſalts obtained from them by evaporation, diſſolved in broth, may be uſed for the ſame purpoſe.

People, on firſt drinking theſe waters, ſhould begin with taking four or five pounds at repeated draughts; and gradually increaſe the quantity to eight; and in general, they ought not to exceed this quantity; though ſome ſtrong people drink ten or twelve.

If the waters are found to load the ſtomach, and not to paſs off eaſily, or if they occaſion a vertigo or other troubleſome ſymptoms, the quantity ought to be diminiſhed.

After the time of drinking the waters in the morning is over, coffee, or chocolate, with a biſcuit, or ſome other ſuch light thing ought to be taken for breakfaſt; and at mid-day dinner, which ought to conſiſt of ſome light food; and after dinner, thoſe who are accuſtomed to it, may take their afternoon ſleep, though ſome years ago, this was thought to be a very dangerous practice.

In the evening, the water-drinkers ought in dry weather to walk about, but not to uſe any ſuch violent exerciſe as to bring out a ſweat, and they ought to take ſome light thing, at an early hour, for ſupper.

The time for bathing is in the morning, and the patient ought not to remain in the bath above an hour, but leſs if very weak. Bathing the whole body is in general more proper, and anſwers better than either the pediluvium or ſemicupium.

After coming out of the bath, and being well dried, the patient ought to go to bed, and remain there at leaſt an hour, to promote a free perſpiration and ſweat; and the ſame rules are to be obſerved in the afternoon, if the bath is ordered to be repeated, which is ſeldom practiſed, except in very particular caſes.

The ſame may be ſaid of the mud, and vapour baths, and of the pumps or douches; but when the douches are uſed for the cure of wounds, the ſtream of water ought to be ſmall at firſt, and the fall leſs than when they are uſed for internal complaints. In ſome caſes, the going into the warm bath previous to the pumping is adviſeable, and the pumping ought to be continued from half an hour to an hour.

The

The mud of the baths is often applied to diſeaſed parts, the thickneſs of half an inch, and let remain expoſed to the rays of the ſun till it is dry; and this operation is repeated two or three times in the day.

CHAP. V.

OF HOT CHALYBEATE WATERS, WHICH HAVE BEEN MENTIONED, BUT NOT PARTICULARLY DESCRIBED.

THOSE we ſhall mention at preſent, are moſtly taken notice of by *Baccius*, in his treatiſe de Thermis; they are ſaid to have a ſulphureous ſmell, and are all except one ſituated in Italy.

ITALIAN.

CALDANA.
PETRIOLI.
CALDANELLA.
MACERETO.
CANTARELLI.
VITERBO.
RUSELLI.
SABATINE BATHS.
ANDREDOCHUM.
HOLY WATER.
AVINION.
ST. MARTINS.
CALDERIUM.
CASTILLO.
BATHS OF ST. CASSIAN.

CORSICA.

SWISS.

LEAK.

ITALIAN.

CALDANA.

Baccius, in his ſixth book *de Thermis*, *page* 197, tells us, that on the ſea-coaſt, near to Leghorn, are many mineral waters both hot and cold, and that to the left of Leghorn, in the county of Piſa, not far from the old town of Pepulonia, are the warm waters of Caldana, which are impregnated with iron and alum; probably what *Baccius* calls alum, on further examination may prove to be a calcareous Glauber ſalt or natron.

The ſmall river Carnia runs into theſe baths, and renders them ſo temperate, that fiſhes live in them.

F. *Leandro Alberti*, the Bologneſe, in his deſcription of Italy, mentions theſe waters as a bog or lake, Caldane palude; the water of which is hot, and ſaid by *Antonio* to be nearly of the ſame kind as that at Viterbo.

PETRIOLI,

In the county of SIENA, in ETRURIA.

Near the ſulphureous baths of Petrioli are the ſtone baths, which are ſaid to be of a temperate heat, and to abound with ſulphur and iron.

CALDANELLA,

In the SIENOIS.

This bath, which is near to the bath of Petrioli, is temperate, warm, or tepid and impregnated with iron; the water is both drank and uſed as a bath.

MACERETO,

Four miles from PETRIOLI.

The water is clear, and has a ſtyptic ſmoaky taſte, as if it contained iron and alum; it is not ſo hot as many others.

CANTARELLI,

A chalybeate bath in the Puteoli, about three miles below the promontory of Miſenum.

VITERBO, in TUSCANY.

At this place are four hot chalybeate ſulphureous baths. 1. The buſſetum. 2. The croſs bath. 3. The bath of the palace. 4. The long bath next the Bullican.

1ſt. The water of the buſſetum is clear and uſed in nervous complaints and cholics.

2d. That of the croſs bath is thicker, and is moſtly uſed as a pump, *ad duccias*.

3d. That of the palace was thought to have a mixture of alum, and to be more drying than the others.

Baccius mentions other warm baths in this country, ſuch as thoſe of *Jaſielli* or *Jaſi*, which, he ſays, are impregnated with iron and alum, and he adds, with ſulphur, though they have no ſmell; they are limpid, hot, and inodorous; they are not purgative, but of a ſtrengthening, drying nature. In the ſame manor are the baths of *Pipini*, and the balneum *ſcopuli ad duccias*.

RUSELLI,

Or ROSETO bath, in TUSCANY, near the ſea-coaſt, and not far from the river UMBRO.

The water is tepid and very clear; it is a chalybeate, but has very little mineral taſte; is called ſulphureous, and ſaid by old writers to contain alum, probably natron or calcareous Glauber ſalt.

SABATINE,

About eighteen miles from ROME, near the Stygian.

The water of theſe baths is a temperate ſulphureous chalybeate.

ANDREDOCHUM,

Near to the town of ANDREDOCHUM, in the country of the SABINES,

Is a tepid ſulphureous chalybeate bath, uſeful in the ſcab, and in the cure of ſmall ulcers, which proceed from diſeaſes of the liver.

HOLY WATER, BELOW ASCULUM,

Situated ten miles from ASCULUM, in the country of PICENUM.

This is a warm ſulphureous chalybeate; its colour, taſte, and ſmell, ſhews it to be ſulphureous; and it tinges ſilver, and lets drop an ochreous ſediment, and emits a vapour, which is pungent and affects the eyes, eſpecially the firſt day of uſing it, but afterwards not ſo much. There is likewiſe here a pump or balneum ad duccias, which is uſed for ſtrengthening weak parts.

AVINION, IN THE SIENOIS,

In the country of SIENA, near the twenty mile ſtone, on the VIA ROMANA, in the diſtrict of AVINION,

Are warm chalybeate baths, which are uſed for the cure of diſeaſes. There are different baths here, both bathing in and for pumping water on diſeaſed parts. There are many mineral ſprings, both hot and cold, in this neighbourhood.

ST. MARTINS,

Situated eight miles from the town of COMUS, in the country of MILAN.

Theſe baths are tepid, have a ſaltiſh taſte, and are alledged by *Baccius* to contain iron and nitre, and to be laxative. There is here a pump and a lutum or clay.

CALDERIUM,

About ten miles from VERONA,

Is a tepid chalybeate bath; the water is clear, and not ungrateful either to taſte or ſmell. *Fallopius* denies that it is a chalybeate, as other authors have alledged, though he owns, that it drops a ruſt or ochre; and he ſays, it contains little or no ſulphureous vapour, but that it taſtes ſaltiſh, and ſome ſalt is got by evaporating it; it is not purgative, and it is drank for complaints of the ſtomach and bowels; it is much uſed as a bath, and for fomenting weak parts.

CASTILLO,

A warm ſulphureous water, in the iſland of Ænaria.

BATHS OF ST. CASSIAN.

The caſtle of ST. CASSIAN, in the country of SIENA, is near the old town of CLUSIUM, in ETRURIA.

Theſe baths ſeem to be the ſame as thoſe which were called Balnea Cluſina, in time of the Romans.

Victorius Mannius[h], in his treatiſe on theſe waters, ſays, that there are many ſprings of hot waters in this neighbourhood,

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[h] De Balneis, Sancti Caſſiani, Tractatus, *Victorio Mannio*, auctore *ſenis*, 1617.

hood, but that there are only ten which are in common uſe, *viz.*

Three within a ſtone's throw of the caſtle.

1. The large bath, commonly called *Bagno della Terra.*
2. The balneum *Buxi* or *Della grotta.*
3. The balneum Caldanæ.

Four within half a mile of the caſtle.

4. The pump bath or *Balneum ducciæ.*
5. The bath of *St. George.*
6. The bath of the bleſſed virgin, *St. Mariæ.*
7. The bath for the liver, *Balneum ſicuncella.*

One a mile and a half from the caſtle.

8. The mud bath, or Balneum luti.

One a mile from the caſtle.

9. The *Balneum piſcinæ.*

One two miles diſtance.

10. The *Balneum de fraticellis.*

Baccius only mentions the firſt eight, but takes no notice of the other two.

The waters of all theſe waters are ſaid by old authors to be impregnated with iron and alum, to which *Baccius* adds ſulphur, though the experiments ſince made with theſe waters ſhould ſeem to prove that they contain none of theſe ſubſtances.

They are of different temperatures, and have been uſed for different purpoſes. *Baccius* gives the following account of the firſt eight:

1ſt. The water of the *great bath*, is the hotteſt of any; it is both drank and uſed as a bath; it is diuretic and recommended in complaints of the bladder and uterus; it ſtrengthens the ſtomach, and is uſeful in flatulencies and other diſorders of the bowels.

2d. The *Balneum buxi* or *Della grotta*, is of a temperate heat, and its water incruſtates the bath and channels through which it runs, with a yellow cineritious ſtony matter, like tutia; but which *Baccius* ſays, he found to be a ſpecies of pyrites. The water is diuretic and purgative, aſſiſts digeſtion, and reſtores a loſt appetite.

3d. The water of the *Caldana* is next in degree of heat to that of the great bath; for, at firſt one can ſcarce ſuffer it; uſed by way of a bath, it has been much eſteemed in the cure of cutaneous diſorders.

4th. The water of the *balneum ad ductias*, is pumped or let fall on particular parts, to diſcuſs ſwellings, and remove pains, and other complaints.

5th. The bath of *St. George* is warm, and uſed for the cure of wounds, and it has a mud that is uſed for the ſame purpoſes.

6th. The water of the bath of *St. Mary* is moderately warm, and recommended much for the cure of contracted and convulſed limbs, and for the rheumatiſm, gout, and other diſorders.

7th. The water of the *Ficoncella* is moderately warm, very limpid, and taſtes of iron, though not to be diſagreeable; it is diuretic, and thought to be ſerviceable in diſeaſes of the liver, from whence it has got its name, having been called *Ficunſella*, or *Figutella*; and it has been recommended in many diſeaſes of the other viſcera.

8th. The water of the *Balneum luti* is of the ſame nature as that of the other baths, but the ſoil in the neighbourhood, is a muddy clay and very fit to be uſed for bathing weak or diſeaſed parts.

9th. Dr. *Victorius Mannius* ſays, that the water of the *Balneum piſcinæ* is muddy, and has a ſalt taſte, which none of the others have, otherwiſe it agrees with them, in heat and other qualities: it has been much neglected, and there is no building round it; however, it has been thought good for the cholick and other complaints of the bowels, and has been preſcribed in diſeaſes of the uterus.

10th. The balneum de *fraticellis*, called ſo from a convent of monks that was formerly here, is likewiſe very little uſed. *Victorius Mannius* ſays, it contains a bitumen, or petrolium, and he recommends it for the cure of cutaneous diſorders.

BATHS of St. CASSIAN.

Dr. *Jacopo Fillippo Baſtiani*[i], in the year 1733, publiſhed a particular treatiſe on theſe waters, in which we have a pretty exact account of the baths, and of the waters as taken up from the fountain, and of experiments made with them in that ſtate; though his account of the quantities and nature of the earths and ſalts, obtained by evaporation, is not ſo diſtinct as could have been wiſhed.

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[i] De' Bagni di S. Caſciano oper. med.

The baths of St. Caſſian are ſituated in the country of Siena, between the high mountains of Santa Fiore and Cetona.

They are twelve in number, which are at preſent uſed for drinking, bathing in, pumping on weak or diſeaſed parts; and the mud or lutum of ſome of them for rubbing on weak or paralytic limbs.

The twelve baths are,

1. *Bagno grande*, or *della Terra.*
2. *Caldagna.*
3. *Bagno Boſſo*, or *del Poggio.*
4. *Bagno della grotta*, which is compoſed of two baſons from the laſt.
5. *Doccia della Teſta*, or *Caldagna cotta.*
6. *St. Georgio*, or *le Doccie.*
7. *Ficoncella*, or *Fegatella.*
8. *San Giovanni.*
9. *Santa Maria.*
10. *Bagno 2do. di Santa Maria*, or *St. Georgio per immerſione.*
11. *Bagno al Loto.*
12. *Bagno di Fratirelli.*

The waters of three of theſe baths are uſed for drinking, *viz.* of the *Bagno grande*, of the *Boſſo*, and of the *Ficoncella.*

Four have pumps, or falls of water, which are uſed for pumping the waters on diſeaſed or weak parts: the *Bagno grande*, the *Doccia della Teſta*, the *Doccie di S. Georgio* and the *Ficoncella.*

Five ſerve for bathing in, *viz.* the *Bagno grande*, the *Bagno della grotta*, the *two ſancta Maria*'s, the *Ficoncella*, the *S. Giovanni.*

And laſtly, the mud or clay of the *Bagno al loto* is uſed for covering weak, or paralytic members.

There are many other ſprings of hot waters in this neighbourhood, but none of them are at preſent uſed medicinally.

Theſe waters are of different temperatures and ſpecific gravities, and yield more or leſs earth by evaporation, but in other reſpects are nearly of the ſame nature.

They are all very limpid, and keep long without corrupting, or loſing their tranſparency.

They are inſipid and have no ſmell, either when taken up hot from their ſprings, or after they have cooled.

When they have ſtood ſome time in their baſons, there gathers on their ſurface a clear brown ſcum, like to that which comes on lime water, after being expoſed to the air; and if taken off and dried, it appears like ſea ſand, but is finer and lighter; and when it is collected in quantity, or the water is put in motion, it precipitates and forms a cruſt on the bottom and ſides of the bath.

All the conduits and channels of theſe waters are covered with earthy cruſts, which are of different conſiſtences and colours, hard, friable, light, heavy, brown, green, &c. but they have neither taſte nor ſmell.

There gathers on the walls of the baths an afronitron, which is very white and taſtes of nitre; and here and there a very white pungent ſaline matter, of the nature of common ſalt, adheres to the earthy cruſts already mentioned.

On a change of weather, there ariſes within and without the baths an exhalation which appears like a cloud, but which is not troubleſome, and does not ſtimulate or otherwiſe affect the eyes or noſe; and it goes off like the ſmoak of gunpowder, when fired; it begins like a thick ſmoak, and ſpreads as it riſes. There gathers a fine green moſs on the bottom and ſides of ſome of the baths.

There ſwims on the ſurface of the waters, diſcharged from the baths, particularly in the two laſt baſons which come from the great bath, a fungous greeniſh ſubſtance, raiſed from a greeniſh earth, which in time becomes of an orange colour; and if the waters do not paſs as uſual through the baſons, it condenſes into a fine friable light tartareous ſubſtance, like pumice ſtone.

In repairing the bath of St. Mary, in the year 1730, there was found a piece of fine fungous earth, ſoft as paſte and white as ſnow, which when dryed became like burnt alum, and was inſipid; the like was not ſeen before, nor ſince.

The waters are of different degrees of heat, ſome hot, ſome cold, but one may go into, and remain for ſome time in the hotteſt without hurt.

Dr. *Baſtiani* meaſured their different temperatures with a thermometer, the liquor of which roſe to twenty-ſix in the open air, on the 26th of June; but he gives us no other ſcale by which we can aſcertain the exact degrees of heat: however, as Dr. *Bianchi*[k] tells us, that the quickſilver in *Fahrenheit*'s thermometer ſtood at ſeventy-ſix in July, at Piſa, we may ſuppoſe that it riſes to ſeventy-four in the end of June; and that this is equal to the twenty-ſix degrees in Dr. *Baſtiani*'s thermometer. The heat of the different baths raiſed his thermometer after it had remained five minutes in each of the waters as follows,

			Fahr.
1.	In the *Bagno grande* raiſed his therm. to	40 =	113 $\frac{11}{13}$
2.	———— *Caldagna*	41 =	116 $\frac{9}{13}$
3.	———— *B. Boſſo*	38 =	108 $\frac{2}{3}$
4.	———— *B. della grotta*	35 =	99 $\frac{8}{13}$
5.	———— *Docia della Teſta*	41 =	116 $\frac{9}{13}$
6.	———— *di S. Georgio*	40 =	113 $\frac{11}{13}$
7.	———— *di Ficoncella*	36 =	102 $\frac{6}{13}$
8.	———— *di S. Giovanni*	37 =	105 $\frac{4}{13}$
9.	———— *della Santa Maria*	39 =	111
10.	———— *di S. Georgio per immerſione*	38 =	108 $\frac{2}{13}$

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[k] See Dr. Bianchi *Trattato dei Bagni di Piſa.*

[i] This calculation is made on a ſuppoſition that the ſcale of Dr. Baſtiani's thermometer begun at the ſame point as Fahrenheit's; but if it begun at the freezing point the degrees will be as follows:

$40=96\frac{8}{13}$ $39=95$ $37=91\frac{10}{13}$ $35=88\frac{7}{13}$
$41=98\frac{3}{13}$ $38=93\frac{5}{13}$ $36=90\frac{2}{13}$

Though perhaps the degrees of heat here aſſigned, according to *Fahrenheit*'s thermometer, may not be perfectly exact, yet if Monſ. *Baſtiani*'s thermometer was well made, it is probably near the truth; for the heat of the air in June commonly raiſes the quickſilver in *Fahrenheit*'s thermometer between ſeventy and eighty in Italy.

Spirit of vitriol dropt into theſe waters, did not make them turbid, or in any manner deſtroy their clearneſs, or give any ſulphureous ſmell; and powder of alum deſtroyed nothing of their clearneſs.

Oleum tartari per deliquium made them milky, and vinegar reſtored their brightneſs; and ſpirit of ſal ammoniac made them likewiſe milky, and gave an urinous ſmell.

They did not diſſolve ſoap, but decompoſed it; a decoction of galls dropt into them, did not diſturb their clearneſs, but upon the addition of ſome drops of ſpirit of vitriol to the waters mixed with the galls, they became immediately black.

From theſe experiments, it is evident, that they neither are impregnated with ſulphur,

phur, alum, nor iron; for had they contained ſulphur, the ſpirit of vitriol would have made them white, and turbid, and given a ſmell of ſulphur; and the powder of alum would have made them milky, and depoſite a white earth.

Had they contained alum, then oleum tartari per deliquium would have made them immediately milky with a great coagulum; and the addition of diſtilled vinegar would have precipitated the whiteneſs to the bottom, and the water would have remained clear above; and had they contained iron, the decoction of galls would have given ſome ſhade of a red, purple, or black; and ſpirit of vitriol would have reſtored their tranſparency; the oleum tartari per deliquium would have made them of an obſcure green; and the ſpirit of ſal ammoniac of an orange colour.

He next evaporated thirteen pounds of the water of the great bath, with a very gentle heat; before the water was entirely evaporated, he removed it from the fire, and let it ſtand a night in a cool place, and there concreted in the middle of the liquors a downy flowery ſubſtance,

ſtance, like the afronitron which ſhoots from the walls; it was inſipid, but diſſolved again in its own liquors by ſhaking; next morning he evaporated the remainder of the water, and had two ſcruples and a half of a ſediment, of the colour of the tartar of white wine, which had a ſaltiſh taſte; and on being waſhed with common water, and that water filtrated, and evaporated yielded two grains of ſalt of a ſquare figure: the ſediment which remained, weighed four *denari* (or ſcruples) and appeared full of ſmall lucid bodies or ſpangles. *There ſeems to be ſome miſtake committed here, with reſpect to the quantity of the laſt ſediment, for the original ſediment mentioned, was only ſaid to have been two ſcruples and a half.*

In performing the evaporation, a very ſubtile yellow coloured ſubſtance attached itſelf to the neck, or mouth, of the pipkin in which the operation was performed.

Thirteen pounds of the water of the *Bagno boſſo* were evaporated in the ſame manner; and there concreted near the mouth of the pipkin a ſubtile, white, inſipid ſubſtance; before the evaporation was entirely completed, the pipkin was removed from the fire, and there concreted in the water an inſipid nitrous efflorefcence, which diſſolved again in its own water by motion, and was exactly ſimilar to what had been obſerved in the water of the great bath; after the evaporation was completed there remained five *denari*, or ſcruples, and ſix grains of a white earth full of little lucid bodies, which, on being examined with a microſcope, appeared to be of the figure of parallelopipedons; this ſediment had a ſaltiſh, ſandy taſte; was ſharper and reduced to a finer powder than that of the great bath; and being well waſhed with common water, and that water filtrated, and evaporated, yielded eleven grains of ſalt, and there remained four ſcruples and a half of ſediment.

Thirteen pounds of the Ficoncella water were evaporated in the ſame manner; and a white ſubſtance attached itſelf to the ſides of the evaporating veſſel during the operation, till the water was reduced to near four ounces, after which it yielded no more; but on its being ſet a part, the downy ſubſtance like afronitron concreted, but it was a little ſaltiſh, and not inſipid as in the other waters; the white ſubſtance, abovementioned, being ſcraped off with a penknife, and put on the fire gave no ſmell, nor ſuffered any change, nor moved; but part of it on being diſſolved in water gave ſomewhat of a ſmell, and a ſlight taſte of ſulphur, and a little ſharpneſs which laſted for ſeven or eight minutes; being viewed with a microſcope it appeared to be compoſed of hexagons, raiſed on ſquare baſis, like to ſnow when it firſt falls.

The earthy ſediment weighed eight denari, and was ſimilar to that obtained from the other waters; and by lixiviation, it yielded half a ſcruple of ſalt.

Three pounds of the water of the *great bath* were put into a flaſk, which was ſet over the boiling ſpring of the ſame bath, and there let remain for a month to evaporate; at the end of which time its water was reduced to one pound, which was quite inſipid, though it felt a little rough; on examining the flaſk, he found a white downy ſubſtance attached to its neck, which taſted ſaltiſh; and on being mixed with the ſolution of ſublimate mercury, it changed to an orange colour.

In order to diſcover the nature of the volatile parts of this water, he cut out the bottom of an earthen retort, and fixed it over the boiling ſpring of the great bath, and covered its top with the head of a cucurbit, the ſpout of which he put into the mouth of a flaſk; and after having luted well all the joinings, he let it remain for eight days, in which time there diſtilled into the flaſk three pounds of a pure inſipid water, ſimilar in every reſpect to common diſtilled water; but on examining the neck of the flaſk, he obſerved on the inſide a certain incruſtation, which appeared like a dew; it was firmly attached to the glaſs, and taſted extremely ſalt; when ſcraped off with a penknife, it weighed three grains, and was extremely white and lucid; and on being mixed with a ſolution of ſublimate mercury in water, it precipitated the murcury, to the bottom, of an orange colour in the ſpace of an hour.

The inſide of the walls of the great bath, and of ſeveral of the channels through which the waters run perpetually, after being locked up all the winter, were found covered with a white ſubſtance in form of a dew, or rather an afronitron, which ſeemed to be of two ſorts; for part of it taſted of ſalt, the other of nitre, and on being mixed with a ſolution of ſublimate mercury it became ſuddenly of an orange colour; this change of colour is the more remarkable, as neither the earths nor ſalts, obtained by evaporating theſe waters, made any change of colour with the ſolution of ſublimate mercury.

The crude tartars, or earths left after the evaporation of the waters, ferment ſome more, ſome leſs upon the addition of ſpirit of ſulphur: the earth and ſalt of the *Bagno boſſo* fermented the moſt, and that of the *Ficoncella* the leaſt.

It is not eaſy from this account, to determine exactly either the nature or quantity of the ſalts, and earths, with which theſe waters are impregnated; they ſhould ſeem to contain ſea ſalt, and a calcareous earth, and probably a proportion of natron and ſelenite; beſides other earths, and a particular ſort of ſubſtance, which concretes when the waters are near evaporated, and which diſſolves again in the water by ſhaking; the nature of which we cannot aſcertain by the account given of it; and it is therefore to be wiſhed that we had a more exact and particular analyſis of theſe waters.

They are drank for variety of complaints from five to eight or more pounds in the day; in large quantity, they prove purgative, and when the intention is to purge, people often mix ſome mild purgative medicine with the firſt glaſſes; if the waters do not paſs off eaſily either by ſtool or urine, their uſe ought to be intermitted for ſome time, or entirely laid aſide.

CORSICA.

In this iſland are ſeveral hot chalybeate waters, ſuch as the *Bagni di vico in balagno*, in the diſtrict of Alecca; the baths at the caſtle of *Morrazzana*, in the dioceſe of Mariana; others at the caſtle of *Barices*; and others ſtill hotter in the country of *Talagas.*

SWISS.

LEAK.

At the city of Leak, in the province of Valais, in Switzerland, is a warm chalybeate bath.

CLASS

CLASS IV.

OF HOT WATERS, WHICH ARE PRINCIPALLY IMPREGNATED WITH AN EARTH.

MOST waters, both hot and cold, contain more or leſs earth of ſome kind or other; but we ſhall at preſent only conſider under this head a few warm waters, whoſe virtues have been principally attributed to the fine earth they contain; though the ſmallneſs of its quantity leaves great room to doubt whether it has much effect.

Thoſe we ſhall conſider, are,

ENGLISH.

BRISTOL.

BUXTON.

IRISH.

MALLOW.

FRENCH.

NECTAIRE.

D'AX EN GUYENNE.

HUNGARIAN.

BUDA.

ENGLISH WATERS.

BRISTOL,

In the county of SOMERSET, about a mile below the city of BRISTOL, on the bank of the river AVON.

At the bottom of a rock ſprings up a tepid warm water, which formerly went by the name of St. *Vincent's well,* from a chapel dedicated to that ſaint, which ſtood on the rock above it; but it is now known by the name of the *hot well;* and by ſome it is called the *old hot well,* to diſtinguiſh it from another of inferior note, which is called the *merchants,* or *new hot well,* and is about a mile lower on the ſame ſide of the river.

It riſes about fifteen or ſixteen feet above low water mark, within reach of the tide; but is covered with a building, and the water raiſed thirty feet by means of a pump, into a houſe called the *pump-room.*

Notwithſtanding that the ſpring is every where ſurrounded with a wall, it is ſometimes

times fouled by high tides, and heavy rains, after a long courſe of warm dry weather: when this happens, the ſpring is pumped till all the tide or rain water is exhauſted, and the mineral water is found to be of its natural brightneſs and warmth.

Dr. *Lucas* has given us the following account of this water:

He ſays, it is clear, colourleſs, pellucid, and ſparkles as it comes from the pump; and if let ſtand in the glaſs for ſome days, it covers its inſide with ſmall air bubbles which remain, and it does not throw up any pellicle, nor drop any ſediment, though it loſes a little of its pellucidity; kept cloſe, it ſeems to ſuffer no loſs, but the cauſe of its ſparkling.

It has no ſmell, and feels ſoft and agreeable to the taſte; it raiſed *Fahrenheit*'s thermometer to eighty-three and eighty-four, when the temperature of the air varied from ſixty-eight to ſeventy-five; though the Doctor tells us, that when lord *Macclesfield* tried it with a thermometer it did not raiſe the quickſilver to above ſeventy-ſix and a half[m].

Forty drops of ſyrup of violets, mixed with two ounces of the water, ſtruck immediately a ſea green, which heightened gradually to a graſs green, and after eighteen hours, it had a yellowiſh caſt; water that had ſtood for ſome hours produced thoſe changes more ſuddenly.

Six drops of an alkaline ley cauſed a milkineſs at each drop, with a ſlight ebullution; in twelve hours a white pellicle appeared on the ſurface, and a large precipitate at the bottom.

Twelve drops of the ſpirit of ſal ammoniac ſenſibly increaſed the ſparkling, if it did not raiſe an ebullition, but cauſed no milkineſs; in twenty-four hours there appeared a ſlight pale pellicle and precipitate, but no air bubbles a top.

Twelve drops of the ſolution of ſoap became milky to opacity, and grumous at mixture; and ſoon after it was coagulated and decompoſed; ſome air bubbles appeared in the glaſs after twenty-four hours.

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[m] Dr. *Lucas* examined the water at low tide, and after long pumping. See part 3, page 354-5 of this Eſſay.

Milk ſuffers no change by being mixed with the water, but dilution; even if boiled with it.

All acids, vegetable, as well as mineral, cauſe a ſmaller or greater increaſe of ſparkling, having the appearance of an ebullition plain and evident.

Twelve drops of a ſolution of corroſive ſublimate produced no milkineſs or change of colour; but in an hour, a pale mother of pearl coloured pellicle aroſe, and by degrees became variegated; and after twenty-four hours the mixture ſtill preſerved its pellucidity, and many air bubbles remained in the glaſs.

Six drops of a ſolution of mercury in the nitrous acid, produced at each drop a milky cloud, which grew quickly opaque, and became of a pale yellow; and in about two hours let fall a grumous precipitate, of a turpeth mineral colour; which was perfectly fallen to the bottom in twenty-four hours.

Four drops of a ſolution of ſilver, at each drop, occaſioned a milky cloud, which ſoon grew opaque; and in about an hour the whole had a milky appearance, but tinged with a purple hue, with ſome apparent precipitation of a deeper colour; in twenty-four hours it appeared perfectly precipitated of a darker purple, more upon the blue, and retained ſome air bubbles.

An infuſion of galls produced no other change of colour, upon mixture, than it does with diſtilled water; upon ſtanding, it grew milky, and turned to a pale green.

Set over the fire in a thin veſſel, it preſently covered the ſides and bottom with numerous minute air bubbles, which increaſed in number and ſize, as the liquor heated; and then they roſe with rapidity to the ſurface, ſo that the water appeared to boil before it was thoroughly hot; by the time it boiled, it loſt of its pellucidity, and depoſited a pale terrene chalk-like matter to the bottom and ſides of the veſſels; of the ſame kind as what is found adhering to the bottom and ſides of the tea kettles, about the hot wells, in which it has been often boiled.

After it was boiled, it diſſolved ſoap, and was as ſoft as rain water.

A gallon of this water, diſtilled in a high retort, with blue paper round the lute, threw up numerous air bubbles as ſoon as heat was applied, and ſoon after, it appeared to boil. What liquor came over into the receiver, differed not ſenſibly from diſtilled rain water, though the blue paper at the luting was ſlightly faded to a purpliſh.

The ſame quantity evaporated at different times, yielded from thirty-eight to forty grains of ſediment.

Forty grains of this ſediment waſhed with diſtilled water, and the whole thrown into filtrating paper, left twenty-one grains of inſoluble matter, which yields a quick-lime by calcination, but does not all diſſolve in any acid; ſpirit of ſea ſalt diſſolved eleven and a half grains, and the remaining ten and a half grains were an inſoluble ſelenite.

The filtrated liquor being evaporated, yielded nineteen grains of a ſaline matter; which on being diſſolved in water, cauſed no change with ſyrup of violets, nor any efferveſcence with acids; but precipitated a white earth when mixed with any of the fixed alkalies, and upon chryſtallizing the ſaline maſs, it proved to be made up of a Glauber and ſea ſalt nearly in equal proportions;

tions; the Glauber ſalt was partly a calcareous, and partly a true Glauber ſalt.

This ſaline maſs, when thoroughly dried and expoſed for about twelve hours to the open air, increaſed three and $\frac{1}{5}$ grains in weight.

The dry maſs upon the addition of the ſtrong acid of vitriol, yielded ſubtile pungent fumes of the acid of ſea ſalt, which were probably mixed with a remaining portion of the volatile vitriolic acid, and mineral ſpirit.

It had been alledged, that the Briſtol water contained iron, alum, and nitre, but the experiments which were made to diſcover them in this water, gave not the leaſt mark of ſuch impregnations.

From what has been ſaid, we ſee, that the Briſtol water is impregnated with a ſubtile mineral ſpirit, a volatile vitriolic acid and air, by which a calcareous and a ſelenitical earth is ſuſpended in them; and that they likewiſe contain a certain portion of a true and calcareous Glauber ſalt and ſea ſalt; that a gallon yields from thirty-eight to forty grains of ſolid matter.

That forty grains of ſediment contain eleven grains and a half of calcareous earth, and nine grains and a half of ſelenite, and nineteen grains of a ſaline maſs, compoſed of a true and calcareous Glauber and ſea ſalt, and a certain quantity of an oily matter common to all waters.

The analyſis of theſe waters, publiſhed by Dr. *Sutherland* in 1758, agrees almoſt in every thing with what is mentioned by Dr. *Lucas*; but he ſays, the heat of the water only raiſed *Fahrenheit*'s thermometer to ſeventy-ſix; fifty pints of the water evaporated afforded two hundred and forty grains of ſolid matter, which is in the proportion of thirty-eight $\frac{2}{5}$ grains from the gallon.

In Dr. *Rutty*'s account of theſe waters we are told, that the quantity of ſolid matter got by different people, has been different; from thirty grains in the gallon to fifty-ſix; which laſt quantity, he ſays, *Shebbaire* obtained by evaporating the water in a retort, inſtead of an open veſſel.

The *merchants* or *new hot well*, is a water of the ſame kind, ſituated about a mile lower, on the ſame ſide of the river.

Dr. *Lucas* obſerves, that the water is not ſo hot, and did not raiſe *Fahrenheit*'s thermometer to above ſeventy-one one fourth; that the ſediment obtained by evaporation contains rather a larger proportion of ſelenite, but that otherwiſe it is a water entirely of the ſame kind as that of the *old hot well.*

The Briſtol, like moſt other mineral waters, have been recommended in great variety of diſorders; in moſt caſes, where the ſecretions are too much increaſed; in the diabetes, the fluor albus and gleets; in old diarrhœas and dyſenteries; in caſes of internal hæmorrhages, ſuch as the hœmoptoe, the paſſing of bloody water, in uterine hæmorrages and immoderate diſcharges of the menſes; they have likewiſe been recommended in the ſtrangury, and in the gravel and ſtone.

And they have been found particularly uſeful in caſes attended with a hectic heat, and fever; and in conſumptions and weakneſs of the lungs.

A courſe of theſe waters requires no further preparation than to empty the bowels, by a doſe of ſome mild lenient purge; if there be any heat, or fever, to

take

take away a few ounces of blood; and during the courſe, if the patient be inclined to be coſtive, to give, from time to time, a doſe of ſome gentle opening medicine.

The common method, of uſing theſe waters, is for the patient when he firſt begins to drink them, to take a glaſs or two before dinner (each glaſs holding above five ounces, or about the third of a pint) and to take the ſame quantity about five o'clock in the afternoon: and afterwards to drink about three glaſſes in the forenoon, and as much after dinner, about five or ſix o'clock; allowing generally about a quarter or half an hour to intervene between drinking each glaſs.

BUXTON, in DERBYSHIRE,

Has long been famed for its warm mineral waters and baths.

Dr. *Short* gives the following account of them:

1. The bath is ſupplied principally by two large ſprings, which riſe up on one ſide, through a rock of ſolid black limeſtone; and by ſeveral leſſer ſprings, which riſe

up all over the bath, through chinks in the rock, and the ſeams of the pavement.

2. Thirty-two yards and a half north-eaſt of the bath is St. *Anne's well*, which is chiefly ſupplied by a ſpring on the north ſide.

3. Twenty yards ſouth-eaſt of St. *Anne*'s, in another cloſe, is a hot and cold ſpring, both riſing up into the ſame receptacle.

4. In the ſame cloſe or field, about ſixty-three yards ſouth-eaſt of St. *Anne*'s, is another hot ſpring called *Bingham well*.

5. Eaſt, a little of this are four ſprings of leſſer note.

In the table of the temperatures of ſeveral baths, in Dr. *Short*'s ſecond quarto volume on mineral waters, page 298, he ſays, the heat of the Briſtol water is to thoſe of Buxton water as follows:

Briſtol water ——	52
Buxton bath — —	59
——— St. *Anne*'s well	58
——— Bingham well	56.

If therefore Briſtol water raiſes *Fahrenheit*'s thermometer to eighty-three, as Dr.

Lucas alledges, then the temperatures will ſtand thus:

Briſtol water —— 83
Buxton bath —— $94\frac{9}{52}$
——— St. *Anne*'s well $92\frac{17}{26}$
——— Bingham well $89\frac{10}{26}$

But if Briſtol water only raiſes *Fahrenheit*'s thermometer to ſeventy-ſix, as Lord *Macclesfield* and Dr. *Sutherland* alledge, then the temperatures will ſtand thus:

Briſtol water —— 76
Buxton bath —— $86\frac{3}{13}$
——— St. *Anne*'s well $84\frac{10}{13}$
——— Bingham well $81\frac{11}{13}$

The waters of all the ſprings at Buxton are quite clear and tranſparent, and betray no ſigns of any heterogeneous particles to the taſte.

Their ſpecific weight, with reſpect to the river water, was as follows:

The water of the bath, when taken freſh up, weighed thirty-three grains in the pint lighter than the river water; and the waters of St. *Anne*'s and *Bingham* twenty-nine grains lighter. When cold they all ſtill weighed twelve grains lighter in the pint, than common water.

Put under the receiver of an air pump, and the air exhauſted, not the leaſt air bubble aroſe, but the waters turned whiteiſh, and weighed ſixteen grains in the pint heavier, immediately after.

All theſe waters become clear with acids, though they raiſe a viſible inteſtine commotion; and the ſides of the glaſs hung full of air bubbles, and turned milky and turbid with alkalies; they brightened a ſolution of gold, exhibited a pearl cloud with a ſolution of ſilver and of ſaccharum ſaturni; they were firſt blue and then green; with ſyrup of violets and they became of a muddy yellow, which changed to a green with galls.

The water of the Bingham well became of a blueiſh green, with ſpirits of hartſhorn; on the mixture of galls there appeared a deep purple ſcum above, and it became yellowiſh in the middle, and of a blueiſh pearl colour at top and bottom.

He evaporated theſe waters different times, and obtained different quantities of ſediment each time.

A gallon of the bath water yielded only a ſcruple of ſediment, one third of which was a ſaline matter, compoſed of ſea ſalt and a calcareous Glauber ſalt, but moſt of the firſt; the other two thirds were earth [n].

A gallon of the Bingham well water yielded twenty-ſeven grains of ſediment, two of which were a ſaline matter, compoſed of a calcareous Glauber and ſea ſalt, but moſt of the firſt; the other third was earth.

A gallon of St. *Anne*'s well water left between twenty-three, and twenty-four grains of ſediment; above one half of which was a ſaline matter, compoſed of a calcareous Glauber and ſea ſalt.

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[n] In a treatiſe on theſe waters, publiſhed in the year 1761, by a phyſician who does not put his name to the work, we are told, that he cauſed four gallons of this water to be carefully evaporated over a gentle fire, and obtained five ſcruples of ſediment; three ſcruples were a light blue coloured earth, the other two appeared to conſiſt of a native alkaline ſalt, mixed with about an equal portion of marine ſalt. He tells us, likewiſe, that about a hundred gallons were evaporated ſome years ago, at the deſire of the late Lord *Lonſdale*, and that the reſiduum was found to conſiſt of earth, marine ſalt, nitre (meaning natron) and a portion of bitumen, which had an aromatic ſmell, ſomewhat reſembling the balſam of guaiacum; but he adds, that he was not able to obtain the leaſt appearance of ſuch an ingredient, and he ſeems to ſuſpect that ſome miſtake had been committed in the evaporating the water. See this treatiſe, page 29, 30, and 31.

The earth of theſe waters is of the calcareous kind; and although aſtringents gave no marks of a chalybeate impregnation in the waters, yet, when the earth was calcined in a furnace that quickly melted iron, and the loadſtone applied, it attracted this duſt or powder very briſkly; from whence he concludes that it contains ſome particles of iron ſtone; which he thinks is further confirmed from the water of the Bingham well ſtriking a reddiſh colour with galls after it is putrefied.

From this account of theſe waters, we ſee that they are of a temperate warmth, and contain but very little of any ſolid matter; at moſt from twenty to thirty grains in the gallon, which is made up of an abſorbent earth, and ſea ſalt, and a calcareous Glauber ſalt; and perhaps mixed with a ſmall portion of natron; for he ſays, the ſalts as well as the groſs ſediment fermented with oil of vitriol.

Moſt common waters contain at leaſt an equal portion of earth and ſalts, and therefore the virtues attributed to theſe waters do not depend on the fixed principles, but moſtly on the pure element, heated to a temperate degree in the bowels of the earth, and impregnated with a fine ſubtile mineral earth.

They are both drank and uſed as baths in various diſorders.

Dr. *Short* tells us, that no other preparation is requiſite before beginning a courſe of them, than to empty the bowels with a doſe or two of ſome mild purge; except in very ſanguine plethoric habits, or where there is much heat or fever, in which caſes, he thinks it may be ſometimes requiſite to take away a few ounces of blood; or where the ſtomach is full of viſcid phlegm, to give a gentle puke.

He recommends drinking at firſt, only a pint of the water before breakfaſt, and as much after it, and to increaſe the quantity, but not to exceed three pints in the forenoon; for he obſerves, that as this water has no purgative quality, it muſt not be thrown down in very large quantity, otherwiſe it is in danger of doing hurt.

During the uſe of theſe waters, he recommends a temperate mild diet, of light food, and particularly to avoid the uſe of hot things; to take gentle exerciſe, but to avoid all intemperance, violent exerciſe, and every thing that will heat too much. He ſays, patients ſhould eat but a very light ſupper, and to take that early in the evening; and to go to bed ſoon, and riſe at five or ſix o'clock in the morning.

That thoſe who uſe the baths, ought to go into them early in the morning, and remain in the bath from ſeven minutes to half an hour, according to their ſtrength; when they come out of the bath, if they intend to ſweat, they ought to go immediately to bed, and there remain for ſome time; if they do not intend to ſweat (which is ſeldom practiſed) they ought to dry their bodies well, and dreſs preſently; and if the weather is cold, they ought to go into a warm room, uſe gentle exerciſe, and walk about, and drink the waters.

Theſe baths and waters have been recommended in rheumatiſms, in arthritic pains, in palſies, in the diabetes, in urinary obſtructions, in cholicks, in the dyſentery, in uterine obſtructions, in diſorders of the lungs, in cutaneous diſeaſes, and in various other complaints.

A phyſician who wrote an anonymous account of theſe waters in the year 1761, obſerves, that in common, with many other mineral waters, they ſometimes affect the head with a ſort of inebriating giddineſs, and ſenſe of fulneſs, and drowſineſs on firſt drinking them; that they ſeem to have no viſible operation different from common water, excepting in being a little more diuretic, and that half a pint before breakfaſt, about two half pints between that and dinner, and three half pints between dinner and ſupper, make up the quantity generally taken by thoſe who are the largeſt drinkers.

IRISH WATERS.

MALLOW,

Near the town of MALLOW, in the county of CORK,

Is a ſpring of a very limpid, and pleaſant taſted water, which Dr. *Rutty* ſays, was firſt introduced into practice by Dr. *Rogers.*

It is tepid, and raiſes *Fahrenheit*'s thermometer to ſixty-eight, and it keeps long in bottles without putrefaction or dropping a ſediment.

It is ſofter than Briſtol water, lathering ſooner with ſoap, and waſhing linen well, as taken immediately from the ſpring.

Ol. tartari per deliquium made it wheyiſh; though ſpirits of hartſhorn and of ſal ammoniac changed it but little from its tranſparency.

The ſolution of ſilver, and of ſaccharum ſaturni made it turbid, and after ſtanding it dropt a ſediment.

It made an ebullition, with both the ſtronger and the weaker acids, even after being kept for years, which the Briſtol water did not.

Tincture of galls exhibited no change, more than with common water; ſyrup of violets turned it green.

Let ſtand in an open tin veſſel, the ſides of the veſſel were whitened, as from an aſperſion of chalk.

Diſtilled, the water that came over turned the ſolution of ſilver of a pearl colour, which, on ſtanding three hours, became of a dilute pink colour, and next morning gave a white and brown ſediment; he recommends the repetion of this experiment to others.

Evaporated over a very ſlow fire, a gallon yielded only twenty grains of ſediment, compoſed of ſalt and earth.

The ſalt ſeparated from the earth in one experiment, was one third part of the whole, in another only one tenth; the ſalt was yellowiſh, ſomewhat unctuous, it was brackiſh, and nauſeouſly bitter; it bliſtered, and ſparkled a little on the red-hot iron, and proved to be made up of a calcareous Glauber and ſea ſalt.

The bath fermented with acids; in one experiment it ſparkled, and in another burnt with a blueiſh flame, when laid on the red-hot iron; and when calcined for two hours, acquired ſomewhat of a limey taſte.

Dr. *Rutty* recommends this water in moſt of the caſes, for which the Briſtol water has been uſed in this country.

FRENCH WATERS.

NECTAIRE.

Mr. de *Chomel*, in the *memoirs of the French academy of ſciences for* 1713. *hiſt.* mentions the tepid water of Nectaire or Nitaire, a pound of which yielded eighteen grains of ſediment, by evaporation; three fourths of this were compoſed of an earthy ſubſtance, the other fourth of ſea ſalt and nitre, by which laſt he certainly means either natron or a calcareous Glauber ſalt.

D'AX EN GUYENNE.

In the town of D'Ax or D'AQS on the river ADOUR, which is the capital of a diſtrict, called *Pays del Landes*, in the province of GUYENNE,

Are ſeveral natural hot ſprings and baths which were known to the antients, who called the place by the name of Aquæ *Tarbellæ* or *Tarbellicæ*. Monſ. *de Secondat*, in the memoirs of the academy of Bourdeaux for the year 1742, gives the following account of them.

The

The hot or boiling fountain riſes in the middle of the town, and diſcharges about a tun and a half of water in the minute, which forms a little rivulet that runs into the Adour; about five hundred yards from this fountain, are the baths for the ſick, which are large holes filled with a muddy water that is not near ſo hot as that of the boiling fountain, though it probably comes from the ſame ſource.

The ſurface of the baſon of the boiling fountain is perpetually covered with a thick ſmoke; the great ſpring riſes at one corner of it, and there the water ſeems to boil, and is hotter than in any other part; it was formerly thought to be ſo deep at this place as to be unfathomable; but Monſ. *Secondat* diſcovered, that it was only four fathom deep.

The heat of the water on the ſurface of the baſon raiſes the quickſilver in *Reaumeur's* thermometer to forty-nine, and at the ſpring head, after all the water is let out of the baſon, to fifty-ſix; which he ſays, is equal to one hundred and twenty-ſeven and one hundred and forty degrees in *Fahrenheit's*; it was formerly alledged, that it was ſo hot as to boil eggs; but this is a miſtake; as is likewiſe the report, that this warm water put over a fire, at the ſame time with cold water, would be later of boiling than it.

It is clear, and tranſparent, and exceeding good, and although it is ſo hot, it emits no ſmell; when cold it is nearly of the ſame weight as common water.

Mixed with different ſubſtances, it gives no mark or ſign of any metallic or other mineral impregnation; except that it precipitates a little from the ſolution of ſilver, which moſt waters do; and hence it ſhould ſeem to differ little from common water.

Twenty-eight pounds, ſix drachms, and fifty-ſix grains of this water diſtilled with a gentle heat, afforded a water which differed in nothing from common diſtilled water.

When one half had come over, there appeared a number of very ſmall, and very thin brilliant plates floating in the water, which remained in the retort; and they reflected all ſorts of colours like a rainbow, and after they had moved about for ſome time, they broke and attached themſelves to the ſides of the veſſel, loſt their brilliancy, ſiancy, and could not be ſeparated afterwards in any other form, but in that of a very fine powder.

Monſ. de *Secondat* filtered the liquor in which they were floating, and ſeparated ſome of them, which he preſerved, and afterwards he went on with the diſtillation; much fewer of theſe bodies appeared than before, but in their place there came a number of very ſmall brilliant chryſtals, which attached themſelves to the bottom of the retort; ſome of them had the form of quadrangular pyramids broke at one end; others of priſms, and ſome were ſmaller, with ſmall flat ſurfaces, without being of any regular figure: they do not diſſolve eaſily in water, nor do they give the leaſt pungent or ſharp taſte when put on the tongue. He collected in all, ſixty grains (a drachm) of them, which remained in the filtering paper, covered with a very fine, and a very white powder.

The water in the retort was by this time reduced to a very ſmall quantity, and had acquired a reddiſh colour, a ſaltiſh taſte, and a ſmell of burnt fat; by which he deſpaired of ſeparating any more of the former matters; and therefore, he diſſolved in this liquor what he had formerly found attached to the ſides of the veſſel, and then filtered it through paper; by which means he obtained a grey earth of a ſurprizing fineneſs and ſubtilty; and then ſet the liquor which had paſſed through the filter to evaporate in an Engliſh ſtone veſſel; it at firſt dropt ſome more of the ſame ſort of earth, which he likewiſe ſeparated, and mixed with the fine brilliant lamellæ he had at firſt collected, and they weighed in all fifty-five grains, and they fermented ſtrongly with acids.

He then went on with the operation, till all the water was evaporated, and he had remaining in the veſſel ſixty-nine grains of a grey ſaline matter, which had a pungent ſalt taſte, and ſomewhat of a ſmell of burnt fat; it run per deliquium in the air, diſſolved intirely in water, and paſſed through the filter[o].

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[o] Hence we ſee that 28 pounds, 6 drachms, and 56 grains yield of ſolid contents,

		hence 8 pounds. nearly
1. Of inſipid chryſtals	60 gr.	$17\frac{1}{7}$
2. Of lamellæ and earth	55	$15\frac{5}{7}$
3. Of ſaline matter	69	$19\frac{5}{7}$
Total	184	$52\frac{4}{7}$

The water of the baths ſubmitted to the ſame trials, yielded the ſame products.

They employ theſe baths for the cure of many diſorders, particularly for the rheumatiſm, but the water of the great fountain is too hot to be uſed as a bath.

HUNGARIAN WATERS.

BATH OF THE GREEN PILLARS AT BUDA.

Dr. Brown, in *his account of the baths of Buda*, mentions this one of the green pillars, which, he ſays, is hot, but is tolerable without the addition of cold water: and that it diſcovers its being impregnated with a petrifying juice on the ſides of the bath, and maketh a great ſtone; but he neither analyſed, nor has particularly deſcribed the water.

OF PLAIN HOT WATERS, AND SOME WHICH HAVE BEEN MENTIONED, BUT NOT PARTICULARLY DESCRIBED BY AUTHORS.

THE waters now to be conſidered, are either ſuch as have no ſenſible taſte or ſmell, or have not been examined, and therefore little can be ſaid of them; it would be endleſs to enumerate all thoſe which have been mentioned by authors, and therefore I ſhall only take notice of ſome few of the moſt remarkable, claſſed, according to the different countries in which they are ſituated.

FRANCE.

In France there are ſeveral warm waters which are quite inſipid, and differ but little from common water, and others which have not hitherto been particularly deſcribed [p].

PREMEAU.
BARDON.
AIX.
VERNET.
LA MOTHE.
DUMAINE.
MONTFERRAN.
CAUTERETS.
ST. MARK.
LES EAUX BONNES.
LES EAUX CHAUDES.

1ſt. The waters of *Premeau* in Burgundy near to Nuits, Monſ. *Du Clos* [q] ſays, are tepid, inſipid, and pleaſant to the taſte; and do not yield more than twelve grains of ſolid matter from the gallon, by evaporation; which is made up of a ſmall portion of ſea ſalt, and an earth not ſoluble in vinegar.

2d. The waters of *Bardon* near Moulins, *Du Clos* [r] ſays, are tepid, limpid, and have no taſte, and on being evaporated, left only a little of a whitiſh, foliated, inſipid earth.

3d. The waters of the warm natural baths at Aix in Provence, formerly called

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[p] Probably, in Meſſrs. *Venel* and *Bayen*'s account of the mineral waters of France, theſe here mentioned, and many others will be particularly deſcribed.

[q] *Du Clos* Obſerv. de aquis mineral. Galliæ. Claſs 3.

[r] Ibid.

Aquæ Sextiæ, have not been analyſed and deſcribed of late, that I have heard of.

4. The village of *Vernet*, in the government of Rouſillon, is famous for its baths; as is the place called *Bains*, in the ſame country where *Louis* XIV. built a fort[s].

5th. The waters of *La Mothe*, are highly eſteemed, as a certain remedy againſt all diſorders of the ſtomach, fluxes, and even lameneſs; being hotter than the waters at Aix, in Savoy, and ſet in competition with thoſe of Bourbon. The difficulty of acceſs makes them little frequented; they are ſituated in Dauphiny, about five leagues from Grenoble, between Treves and La Matheſine[t].

6th. At a village called *Dumaine*, in Languedoc, near the mountains, is a thermal water, which Dr. *Fabrus*[u] recommends in obſtructions of the liver, in the gravel, and other diſorders; but he gives no other account of it, but that when he evaporated it, he had nothing remaining behind, but a little mud, or mucilaginous matter; from which he concludes, that the efficacy of the water depends on its volatile principles.

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[s] *A. F. Buſching*'s Syſtem of Geography, Engliſh tranſlation, vol. ii. page 487. probably they are deſcribed in *Carere's Tracté des Eaux minerales du Rouſillon*, which I have not yet ſeen.

[t] *Buſching's Geography*, ibid. page 434.

[u] See *Petri Joannis Fabri Hydrograph. ſpagyric. lib.* ii. Toloſæ 1639.

7th. Among the Pyrenean mountains, near the province of Sault, is a mountain, called Montferran, where Dr. *Fabrus*[w] ſays, there is a warm water which is in great repute for the cure of the palſy, gout, ſpaſms, cholic pains, and numbneſs of the limbs. He ſays, it is impregnated with no mineral ſubſtance, and differs in nothing from common water, except in its being hot.

8th. Near to *Barege*, at a place called *de Cauterets*, are warm mineral waters. Monſ. *de Secondat* gives the following[x] table of the degrees of heat of the different ſprings, but no deſcription of the waters.

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[w] *Ibid.*

[x] Obſerv. de phyſique & d'hiſt. natur. des Eaux minerales d'Ax, de Bagneres & de Barege, 1750.

	Fahr.
1. *La Riou-Miret du Marechal*, employed for the eyes to	69
2. The ſpring diſcovered in 1746, to	79
3. The temperate ſpring of the ſmall bath diſcovered, in 1742	86½
4. *La Raillere*, employed for baths and for drinking	102¾
5. *Source de Bayar*, which is drank	104¾
6. *Bain de Poſe*	107¼
7. The warm ſpring of the ſmall bath	111½
8. *Gabet*, which is drank	112¾
9. *Mauhourat*, which is drank	113¼
10. *Source de Bois*, uſed for baths and drank	114¾
11. *Grand bain du milieu*	117
12. *Grand bain d'en haut*	118½

9th. Below the *chapel of St. Mark*, near to Clermont, are warm mineral waters and baths, which were diſcovered about the year 1736 or 37, and ſeem to have been formerly in repute. Monſ. *Chomel*[r] ſays, that they have a ſharp vinous taſte, turn red with galls, and ferment a little with acids, which ſhews them to partake of iron; he ſays, he found many water drinkers at this place, who told him that they were perfectly purged, and he eſteems them the beſt mineral waters for drinking in the neighbourhood of Clermont.

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[r] See *Traité des eaux minerales, bains & douches, de Vichy*, &c. par Mr. *Jacque François Chomel*, &c. à *Paris*, 1738.

10th. and 11th. In the fourth volume of the *Comment. de rebus geſt. in Med. et Phil. natur.* page 289, &c. there are two places in the county of Bearne mentioned, where there are warm waters: *Les Eaux Bonnes*, where there are three ſprings that raiſe *Fahrenheit*'s thermometer from ninety to one hundred and two. *Les Eaux Chaudes*, where there are likewiſe three ſprings which raiſe the thermometer from ninety-two to one hundred and fourteen.

SPAIN.

In Spain there is a great number of hot mineral waters, but we have no particular account of any, though ſome of them are mentioned by authors.

MOLGYUS.
ORENZA.
BAIONE.
CALDAS DEL REY.
TRALUS.
SEVILLE.
ANDELUSIA.
FITTER.
ARNEDILLUM.
AQUÆ QUARCENORUM.
BAGNOLE.
VICH.
BEGAR.
ALHAMA.
BELLUS.
TIERMAS.

Baccius, in his book *de Thermis*, takes notice of ſeveral.

In the province of Gallicia, ſituated in the north-weſt corner of Spain, there are warm baths at *Molgyus*, beyond the river Minius; and others at the city of *Orenza* [z], ſituated near the ſame river, which are of different temperatures; and though, in general, they ſmell a little of ſulphur, they are otherwiſe pretty pure, and not ungrateful; at this place, there are the remains of old Roman baths.

On the banks, and in the bed of the river Minius, there are a number of warm ſprings, which riſe up at different places; and ſome at the town of Baione, where it diſcharges itſelf into the ſea.

He ſays, that in the diſtrict, called *calidæ regales* (now caldas del Rey) near the way which leads from Sancto Jacobo di Compoſtella, into Luſitania, there are ſome hot baths; and others at a place, called *Tralus*; and ſome in the diſtrict of

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[z] The *aquæ Quintianæ* and *Celinæ*, mentioned by authors, ſhould ſeem to be the ſame as the baths at *Orenza*.

Seville (Sibilia) in the province of *Andaluſia* (in Bethicis).

He mentions others in the kingdom of Navarre, near the river Iberus, in the diſtrict of Tarracona, fifteen miles from the town of Arnedillum, ſituated at the bottom of the hills, where the river Iberus runs acroſs the country, towards the Pyrenean mountains; beſides others at different places which are uſed as baths, and for other purpoſes; and in this country, there is a round chamber or cave dug in a rock on the ſide of a hill, which is conſtantly filled with a warm vapour, and is uſed as a ſudatory.

Near the province of Caſtille, there are hot waters, called *Aquæ Quarcenorum.*

Baudran, in his *Geographical Lexicon*, mentions waters in the province of Catalonia; one near the town of Geronne (prope Gerundam urbem) called *aquæ calidæ* and Bagnoles; the other at *Vich*, called likewiſe *aquæ calidæ* and *aquæ voconis*; and others near to Tarracona, in the province of Arragon, called *aquæ bilbilinatorum.*

Mr. *Udal ap Rhys*, in his tour through Spain, takes notice of ſome others; he ſays,

1ſt. That at *Bejar*, which is the capital of a dutchy, ſituated ſix leagues north eaſt of Coria, in the province of Eſtremadura, there are baths which are much celebrated; and that there are two ſprings which riſe ſo near to each other, that they ſeem to come from the ſame ſource, though the one is hot, and the other is cold; and different diſorders are cured by bathing in the one, and drinking of the other.

2d. That at *Alhama*, in the province of Granada, which is ſituated ten leagues ſouth-weſt of the town of Granada, there are baths which are much reſorted to.

3d. That at *Bellus*, a ſmall town on the banks of the river Albayda, not far from Xativa, in the kingdom of Valencia, are hot waters, which are much eſteemed by the phyſicians.

4th. And that there are others at *Tiermas*, a village ſituated in the kingdom of Arragon, on the confines of Navarre, ten leagues north-weſt of Zaragocia, and four north-eaſt of Sangueſſa.

Monſ. *Colonne*, in his *Hiſtoire naturelle de l'Univers*, ſays, there are upwards of forty warm mineral waters and baths in Spain, but he gives no particular deſcription of them; he ſays, the moſt renowned, are thoſe called *Las Caldas del Rey*, near to Toledo (Hava fons) which conſume every thing put into them, when hot; though they are good for drinking when cold.

PORTUGAL.

CHIAVES.
AQUÆ LEÆ.
VISEO.
BEIRA ESTREMA.
CALDOS.
ST. PETER DE ALVOR.

There are likewiſe warm mineral waters in this kingdom; Monſ. *Colonne* ſays there are eight: at *Chiaves*, formerly called *Aquæ Flaviæ* and *Aquæ Leæ*, in the Tralos montes, there are warm baths; and others at *Vicus Aquarius*, now called *Viſeo*, in the province of *Beira eſtrema*.

Mr. *Brockwell*[a] tells us, that fifteen leagues from Liſbon, at a place called *Caldos*,

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[a] See his *natural and political Hiſtory of Portugal*, page 101, publiſhed at London, 1726.

dos, there are hot ſprings, and an hoſpital for ſick; and that there are others of leſs note at *St. Peter de Alvor.*

ITALY.

Iſland of PORCITA. | Iſland of ÆNARIA.

There are many warm waters in Italy, and its iſlands, beſides thoſe already mentioned, of which we have no particular account.

PORCITA.

In this little iſland there are ſeveral.

ÆNARIA.

Baccius, in his book de Thermis, mentions ſeveral in the iſland of Ænaria, now called Iſchia, which is ſituated about ten miles off the coaſt of Puteoli, ſuch as

1. The *Balneum coctum*, the water of which he ſays is hot, chalybeate, and nitrous; and its vapour uſed for ſweating.

2. The water of the cave, *aqua ſpelunca*, which is very hot, clear and ſweet, and uſed

as a bath, and for pumping on parts afflicted with the rheumatiſm, and other diſorders; near to this is a warm ſand, which is much uſed as a dry warm bath, or ſudatory, for diſcuſſing anaſarcous and gouty ſwellings, by digging a hole in the ground, knee deep, for the legs; and covering the reſt of the body up to the neck with the warm ſand, and renewing it as often as it begins to cool.

3. A hot water near the old town of Caſtilio, which he ſays is a ſulphureous chalybeate, and uſed as a bath.

4. A warm water, which Baccius calls nitrous, near the limpid ſweet water of Succellaria.

GERMANY.

TOPLITZ.
SCHWEFELBAD.
SCHLANGENBAD.
WILBAD.
CASTEIN.
CELL.
OTTERSWEYER.
BADENWEILER.
WITLICH.

In this country there are many hot waters, beſides thoſe already mentioned; ſome of which ſeem to be pure and free from any remarkable mineral impregnation, and others have not been deſcribed.

The water of *Toplitz*, ſituated weſt of the river Elbe, in the northern part of Bohemia, Dr. *Hoffman* ſays, is extremely hot and limpid, and holds not the leaſt of any ſaline or earthy matter; for after a total evaporation, it leaves no ſolid ſubſtance at the bottom, and exceeds even fine rain water in purity and lightneſs.

The fountain called *Schwefel-Bad*, ſituated without the town of Toplitz, is of the ſame nature, but its water is of a more temperate heat; as are likewiſe the waters at *Schlangenbad*, in the county of *Heſſe*.

Guintherius[b] mentions ſeveral warm and tepid waters, which I do not find deſcribed by late authors; ſuch as *aquæ calidæ ſylveſtres*, ſituated among the mountains, in the diſtrict of Wirtemberg; a hot water at *Caſtein*, in the principality of Salizburg; a tepid water near the town of *Cell* or *Zell*, in the marquiſate of Baden, called *Aquæ Huben-*

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[b] See Guintheri dialogui de Balneis, anno 1565.

ſes; a tepid water near *Otterſweyer*, about a mile and a half from Baden; a tepid water at *Badenweiler*, ſituated on the eaſt ſide of the Rhine, below Baſil and between it and Friburg; a tepid water in the biſhoprick of Triers, at the firſt ſtone from the town of *Wittlich*.

SWITZERLAND.

There are ſeveral hot baths in this country, the waters of ſome of which ſeem to differ little from common water, ſuch as,

PFEFFER OR PIPERINE,

In the country of the GRISONS.

Hoffman extols theſe waters for their purity. *Hildanus*[c], who viſited them in the year 1610, gives the following account of them: they are ſituated in the biſhoprick of Churr or Choir, about two German miles (ten or twelve Engliſh) from the town of Churr; they riſe in a very large, dark cave, about half a league below the village of Valens, in a deep and formerly inacceſſable valley, not far from the borders of the river Rhine; although now the roads are made paſſable for foot paſſengers, but not for carriages; and ſeveral baths and other conveniencies have been built, for the accommodation of thoſe who uſe the baths.

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[c] See *Guilhelmi Fabricii Hildani*, opera omnia, &c. edit. Francofurti ad moenum, 1646, page 655, &c.

The water is as clear as cryſtal, and has neither taſte nor ſmell, and it is of ſo pleaſant and temperate a degree of heat, that, he ſays, every body who goes into the baths, thinks they were warmed to ſuit his particular conſtitution.

He evaporated twenty pounds of the water, and had ſcarce half a drachm of ſediment remaining in the bottom of the alembic, after the evaporation was finiſhed; ſo that this may be looked upon as a very pure water, and certainly does not deſerve to be called mineral, unleſs its warmth intitles it to that name.

The ſprings of theſe waters dry up in very dry winters, but begin again to flow in

May, and continue to diſcharge their waters in full perfection till autumn; in wet winters, they diſcharge a ſmall quantity of waters that is ſcarce tepid.

Theſe waters are ſeldom drank, but are much uſed for baths; and bathing in them is ſo pleaſant, that he ſays, he ſawſo me people who remained eight days together in the baths; and who eat, drank, and ſlept in them; and many who ſtaid in them two days; but he diſapproves of this method of remaining ſo long in the baths, for there have been inſtances of people falling into fainting fits, or aſleep, who have been drowned.

He ſays, the common method, was to be eight or nine hours in the day in the bath; *viz.* two or three hours in the morning, as long before ſupper, and the ſame after it.

The courſe of bathing, he ſays, ought to be continued for a longer or a ſhorter time, from eight to ten hours; according to the length of time the patients remain in the baths daily; he recommends bathing in theſe waters in obſtructions of the liver and ſpleen, in nervous complaints, in the gout, and in other diſorders.

HUNGARY.

Dr. *Brown*, in the account of his journey through this country, given in the Philoſophical Tranſactions, number 59, mentions a number of hot ſprings he met with, particularly in the town and neighbourhood of Buda.

The water of one of theſe, called the Cuzzoculige (the little bath) ſituated in the weſt end of the town, is ſo hot as ſcarce to be endured, and has neither colour, taſte, nor ſmell different from common water. And *Baccius* mentions a number of warm waters and baths, which are ſituated near to the river Wag, in Hungary.

POLAND.

Monſieur *Colonne*, in his *Hiſt. Naturelle de l'Univers*, obſerves, that there are many hot ſprings in Poland, but gives no particular deſcription of any.

GREECE.

Antient authors make mention of ſeveral natural warm baths that were formerly in Greece, ſuch as thoſe at *Thermopolæ* and *Hierapolis*, &c.

ISLAND OF MELOS.

Monſ. *Tournefort*, in his voyage to the Levant, tells us, that the waters of this iſland are all bad, and ſmell of ſulphur; except thoſe of the fountain of Caſtro, which riſe hot, but become very cool in two hours, after which they are very light and ſweet.

The publick baths are at the foot of a hill on the right hand, in deſcending from the town; the entry to them is by a long narrow paſſage, which leads into a chamber formed by nature, which is ſo warm, that it ſweats whoever remains any time in it, and it is uſed as a ſudatory; at one ſide of this chamber is the bath which is filled with a tepid ſalt water, at a place called Protothalaſſa.

Below the baths, and near the ſea, are ſeveral ſprings of hot waters; which, however, are not ſo warm as to make much alteration on eggs thrown into them, and let remain for two hours, though the ſand in their neighbourhood is ſo hot as to roaſt them in a few minutes.

There is perpetually a ſubterraneous fire burning here, which Monſ. *Tournefort* ſeems to think is owing to the iſland ſtanding on a ſpongy rock, which is filled with a mineral of iron, which the ſea water pervades, and cauſes to ferment, and generate heat.

Six miles to the northward of the town is a tepid purging water, of which the inhabitants often drink, till they paſs it as clear as when taken down.

ISLAND OF THERMIA,

Situated in the ARCHIPELAGO.

This iſland formerly got its name from its warm baths. *Tournefort* ſays, that the baths, which are now uſed, are at ſome diſtance from the old ones, of which there are ſtill ſome remain; that the waters here are ſalt, and not quite ſo hot as thoſe at Protothalaſſa, in the iſland of Melos. Formerly theſe waters were much eſteemed, but at preſent they are entirely neglected.

ISLAND OF SCIO.

And he ſays, there are ſources of warm water near the village of Calantura, in the iſland of Scio.

BYTHINIA IN ASIA MINOR.

PRUSIAS.

A mile or two from the town of Pruſias, in Bythinia, near to the bottom of mount Olympus, are warm baths; the water which ſupplies them is ſo hot that it boiled eggs, which Monſieur Tournefort put into them, quite hard in twenty minutes. He ſays, the water is ſweet or rather flat in the taſte, and that its channels were covered with a brown ruſt or ochre.

Near to theſe baths are others called Cuchurtuli by the Turks, becauſe they ſmell of ſulphur.

Two miles from Pruſias, and one from the baths juſt mentioned, on the road to Smyrna, are the baths of Capliza, which Tournefort ſuſpects to have been the antient royal baths, which were ſo much uſed by the old Greeks; and near them is a ſmall bath much frequented by the Turks.

The water of all theſe baths became white with oleum tartari per deliquium, but made no change on blue paper.

IONIA.

SMYRNA.

Near to Smyrna, in the province of Ionia, are ſprings of warm water, which ſupply baths, which were formerly in great repute, but which are now much neglected.

Six miles from Arzerum, or Erzerum, on the Euphrates, at a village called Elija, are baths of a ſweet water, of a moderate heat, which are much frequented by the Turks; they are about five days journey from the Black Sea, and in the road from Cars to Erzerum; there are warm baths at a place called Aſſaacale.

TEFLIS,

The capital of GEORGIA,

At this place there are baths which are ſupplied with a warm water, which is nearly of the ſame nature as that at Elija near Erzerum.

A HOT

A HOT WATER IN JAPAN.

In *Manley*'s Engliſh tranſlation[d] of *Caron*, and *Shorten*'s deſcription of the kingdoms of Japan and Siam, we are told, that theſe countries abound with mineral waters, and we have the following account of a particular hot ſpring, "I have ſeen another at "the foot of a mountain, near the ſea, "which rendered its water but at times, "ordinarily twice in twenty-four hours, "but this flowing did not continue above "an hour; when the wind blows eaſt, "and ſtifly, it flows thrice, and ſometimes "four times in a day and a night. This "water riſes out of a ſtony pit, being co-"vered with huge maſſy ſtones of very "great weight; when the time of flowing "comes, it burſts out of the earth in ſo "great a quantity, and with ſuch a forcible "wind, that thoſe great ſtones are vio-"lently moved and ſhaken; the ſtreams "guſhing, and ſpouting three or four fa-"thoms high, with ſo dreadful a noiſe,

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[d] Publiſhed at London, 1663.

"that it equals that of a cannon, or the "falls of the greateſt rivers. This water "is ſo very hot, that it is impoſſible to "boil ordinary water to its heat; it "ſinges where it falls, and left to itſelf "continues hot thrice longer than any "other. The well is ſurrounded with a "wall for fear of harm, little conduits "being made to convey its ſtreams to the "neighbouring houſes where it is uſed by "way of baths, for curing of all diſtempers and maladies."

Though theſe authors, as well as others, have aſſerted, that this water is hotter than boiling water, yet this fact, I think, may be doubted, till its heat is meaſured with a thermometer.

ICELAND.

In this country, there are ſeveral burning mountains, one of which, called mount Hecla, has been very much taken notice of by naturaliſts; and a great number of hot waters have been found in this iſland; ſome of which are of a moderate temperature, and others of a boiling heat.

The moſt remarkable of theſe, Mr. *Horrebow* in his account of Iceland, ſays, are to be found in the pariſh of Huaſevig, near a farm, called *Reykum*.

He obſerves, that theſe waters have no no taſte; he has found by experiments, that moſt of them contain but very little of any mineral body, though a few ſeem to be ſlightly impregnated with iron.

He mentions a very particular circumſtance, which is, that the water out of the largeſt well, at Reykum, if put immediately into bottles, continues to boil up two or three times; after which the efferveſcence ceaſes, and it ſoon quite ſubſides and cools; and if bottles, filled in this well, be immediately corked, the water commonly burſts them.

JAMAICA.

In the inland parts of the iſland of Jamaica, in the Weſt Indies, are ſeveral ſprings of hot waters, at a place which has from thence been called the Bath.

Theſe waters have not hitherto been analyſed, or particularly examined, though they are mentioned in the philoſophical Tranſactions, number 220; where we are told there are three ſprings, one of which is a ſulphureous water; and another a ſalt water; and the one which was firſt diſcovered, and moſt uſed, is not particularly deſcribed.

FINIS.

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